THE

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REVIEW

Volume 32 - Number 2 February 1952

Fundamental Approach to the Study of Stance Stability and Locomotion in the Cerebral Palsied — HOUTZ, COUNCILL, NORRIS, EUBANK, and HELLEBRANDT

The Treatment of Cerebral Palsy — GILLETTE

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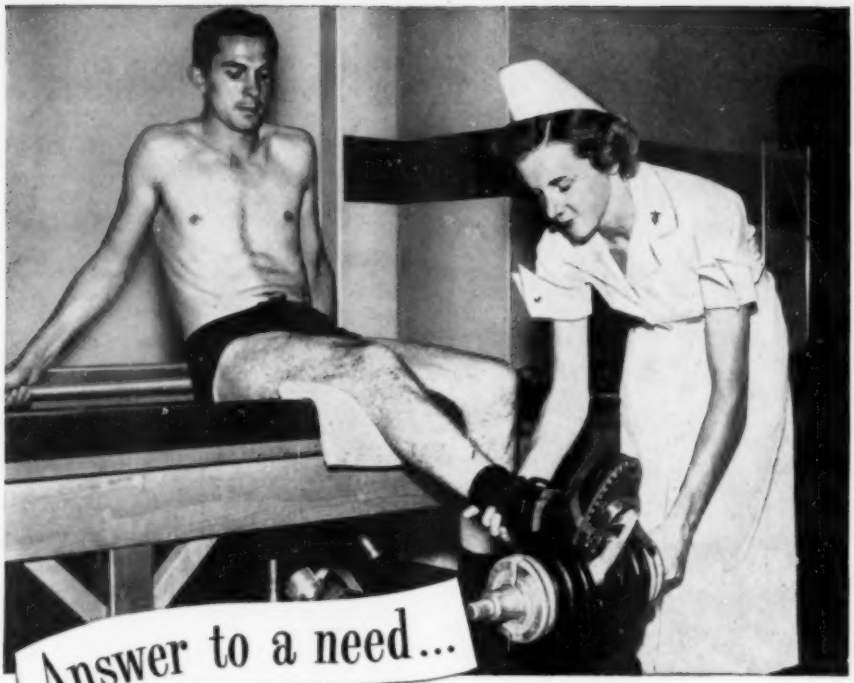

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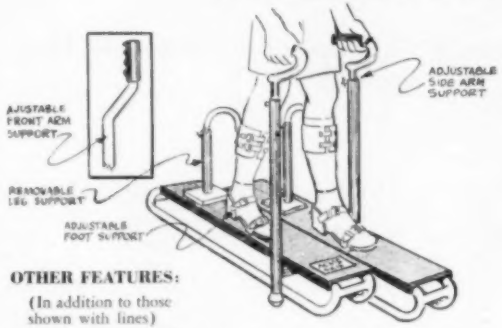

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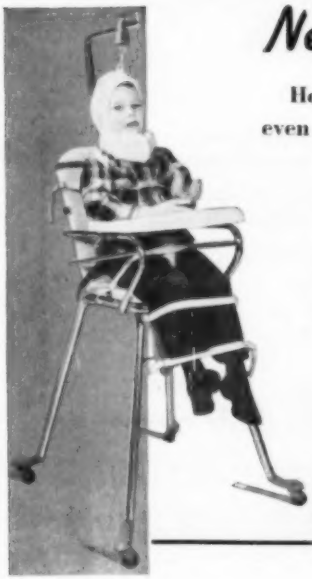

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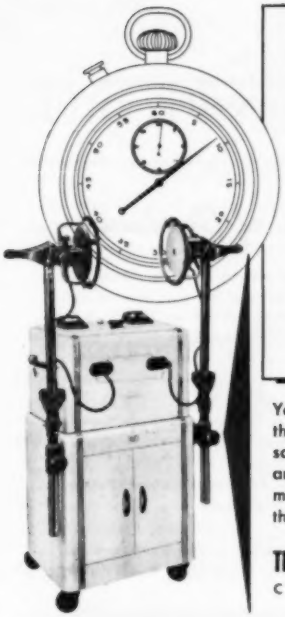

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The Physical Therapy Review

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Volume 32 **February 1952** **Number 2**

Fundamental Approach to the Study of Stance Stability and Locomotion in the Cerebral Palsied*

Sara Jane Houtz, M.S., William J. Councill, B.S., Edward N. Norris, B.S., Robert N. Eubank, and F. A. Hellebrandt, M.D.

Testing and analysis of motor disabilities are often the responsibility of the physical therapist. Repeated observations of the patient's stance and gait are desirable. This is particularly true of the cerebral palsied manifesting athetosis. Since the impressions gained from inspection are short and passing, the fundamental factors responsible for postural instability and difficulties in locomotion may elude even the meticulous observer. These are rarely subjected to quantitative correlative study. It seemed advisable, therefore, to initiate an exploratory investigation of technics which might answer some of the clinical problems of the physical therapist.

The purpose of this study was fourfold: *first*, to record the influence of involuntary athetotic movements on postural stability and alignment; *second*, to observe the effect of exercise on the athetotic component of postural instability; *third*, to find ways and means of assessing the rationale of the stabilizer as used in clinical practice; and *fourth*, to explore the merits of chronophotography in the analysis of athetotic gait patterns. Thus this investigation is concerned essentially with *methodology*.

*From the Division of Clinical Research, Baruch Center of Physical Medicine and Rehabilitation, Medical College of Virginia, Richmond, Virginia. Paper read at the Annual Conference of the American Physical Therapy Association, Glenwood Springs, Colorado, June 20, 1951.

Postural Stability and Alignment

Previous investigations performed in this laboratory or at the University of Wisconsin and reported in the *Review*, demonstrated that although the center of gravity of the body as a whole sways incessantly during standing, its mean position remains remarkably constant in the face of a wide variety of mechanically disturbing factors, as does also the pattern of the involuntary shift in the center of weight. When projected into the base of support, the average center of gravity virtually coincides with the geometric center of the base, disregarding the toes. The latter do not participate in normal standing.

Figure 1 demonstrates the barely discernible magnitude of the shift in the center of gravity of a normal individual during 30 seconds of relaxed and comfortable standing. Contrast this with the postural instability of a young adult patient with quadriplegic athetosis *(Fig. 2 and 3)*, in whom there were 156 major shifts in the center of gravity in 15 seconds of standing. These fell primarily to the left and slightly behind the geometric center of the base.

The postural alignment reflexly assumed to control athetotic instability is characterized by strong flexion of the cervical spine. This is well illustrated in Figure 4. The same attitudinal configuration is

Figure 1

Figure 2

Figure 3

Figure 1. Projection into the base of support of shifts in the C. of G. of the body as a whole of a normal young adult subject during 30 sec. of relaxed and comfortable standing. The major shifts occurred in the A.P. plane to the right of the geometric center of the base (hollow circle) disregarding the toes. The method, based on NEWTON'S THIRD LAW OF MOTION, *is identical in principle to that described by Reynolds and Lovett in 1909 (Am. J. Physiol. 24:286:293). The subject stands upon the upper of two platforms placed at right angles to each other and each resting upon scales equipped with levers for the indication of changes in spring tension. Calibration of the instrument permits conversion of every oscillation of the C. of G. into a change in partial weight, and by equating moments the C. of G. may be simultaneously established in the two vertical orientation planes. By fixing the position of the feet in respect to the knife edges of the two platforms, the data may be introduced into the footprint as illustrated.*

Figure 2. Spontaneous shifts in the C. of G. of a patient with quadriplegic athetosis. The recorded points were obtained by computing the location of the C. of G. in the coronal and sagittal planes at the instant of every major change in the A.P. sway pattern.

Figure 3. Maximal shifts of the C. of G. in the transverse plane during the first 15 sec. of the standing period illustrated in Fig. 2. The solid circles indicate the maximal shifts to the R. and L. during the full thirty seconds of standing.

seen in Figure 5; the patient is now standing in a stabilizer on the center of gravity platform. It has long been known that the neck and labyrinthine reflexes of Magnus and of de Kleïjn affect the postural tonus of the antigravity muscles. Extension of the head is associated with a tendency toward loss of extensor tonus in the lower and increase in extensor tonus of the upper extremities; flexion of the head, with a strong reflex extension of the weight-bearing limbs, contraction of the abdominal muscles, elevation of the chest and forward movement of the arms *(Fig. 6)*. The stabilizing influence of the latter alignment is obvious.

THE INFLUENCE OF EXERCISE ON INVOLUNTARY MOVEMENT

The postural sway occurring in the anteroposterior and transverse planes may be recorded by a moving kymograph. Figure 7 illustrates the involuntary sway of a normal adult with a relatively high degree of postural instability. Contrast this with that demonstrated by the brain-damaged patient *(Fig. 8)*. Note that in the transverse plane there are periodic episodes of athetotic instability during which the patient may lose balance completely, falling backward and to the left. In the course of repeated observations of this type it was noted that activity of a particular kind, previous to standing, suppressed athetosis and secondarily improved postural stability. In Figure 9 we see the salutary effect of heavy resistance reciprocal exercise of the upper extremities while maintaining balance in the erect posture, using an electrodynamic brake ergometer.* This may be due to reflex diminution in the magnitude of the athetosis secondary to improved innervation elicited by exercise performed under the stimulus of a maximally tolerated resistance. It is easy to forget that

*This instrument was devised by Prof. L. E. A. Kelso of the School of Engineering, University of Wisconsin and will be described elsewhere.

Figure 4. Postural alignment of a patient with quadriplegic athetosis during attempted free standing.

Figure 5. Photograph illustrating dependence on tonic neck reflexes to enhance the postural tonus of the antigravity extensors while standing in the stabilizer. Loss of balance invariably elicits strong flexion of the cervical spine.

Figure 6. Tracings from photographs of normal subjects demonstrating the influence of the head position on the alignment of the trunk and the disposition of the appendages.

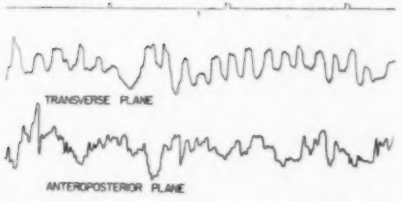

Figure 7. Moving kymogram of the shifts in the C. of G. of a normal subject. (Magnification in the A.P. plane is 65% of that in the transverse plane. This difference is corrected in the calibration procedure for conversion of lever movement to scale indication.)

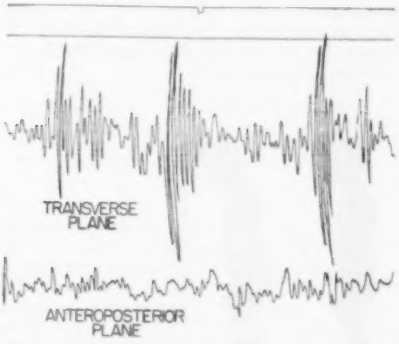

Figure 8. Typical kymographic record of shifts in the C. of G. of a patient with quadriplegic athetosis during free standing. The primary instability occurs episodically in the transverse plane alternating with periods of relative quiescence.

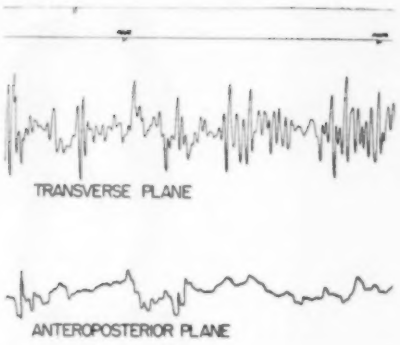

Figure 9. Kymogram illustrating significant decrease in the magnitude of sway following heavy work with the upper extremities performed in the interim between this and the preceding record (Fig. 8.).

involuntary movement of the shoulder girdle and its appendages may have so marked an influence on the location of the center of gravity of the body as a whole as to render effective locomotion difficult or impossible, even though the weight bearing limbs *per se* have reasonably good function. The rehabilitation of such patients is dependent, therefore, on control of the athetosis. Although it may appear paradoxical to prescribe heavy resistance exercise of the upper extremities for improvement in stance stability and free walking, the procedure has a defensible rationale and the results obtained are sufficiently suggestive to warrant further consideration.

Figure 10. The figure on the R. illustrates the postural realignment necessary to maintain the C. of G. in the center of the supporting base when standing in the stabilizer. Compare with the normal control to the L.

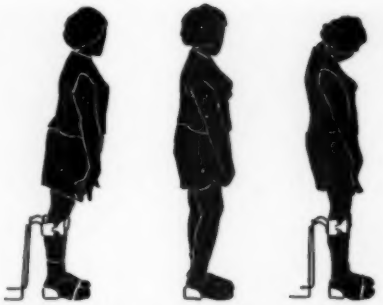

Figure 11. Extremes in postural alignment of a cerebral palsied patient when placed in the below-knee stabilizer. The central figure is characteristic of free standing.

BIOMECHANICS OF THE STABILIZER

One of the devices most frequently used for balance training in the nonambulatory cerebral palsied patient is the stabilizer. The partial fixation of the ankle joint thus provided permits movement patterns normally present to occur, but dampens their magnitude. The value of such prelocomotor experience in adjustment to the stresses of verticality is obvious. Our interest has been limited to the development of technics whereby the biomechanical normality of this training might be assessed. Neither the below- nor above-knee stabilizers available on the open market permit adjustment of the cuff in the horizontal plane. Thus the leg, which is normally flexed on the foot, is pulled backward, and the balance of all superimposed structures is significantly disturbed *(Fig. 10)*. The central sketch in Figure 11 illustrates the characteristic free stance of a cerebral palsied patient; the one to the left, shows the patient hanging on the cuff of the stabilizer in an autonomous effort to keep the center of weight of the body as a whole over the middle of the supporting base. In the figure on the right, the subject is thrown into an equally abnormal posture. The center of gravity now falls so close to the posterior margin of static security as to seriously unbalance the stance. This posture was associated in our patient with a violent degree of athetosis. The instability was compensated for in part by reflex flexion of the head.

To better study the biomechanical problems involved, 40 experiments have been performed on 10 normal adult subjects, 5 male and 5 female, of

Figure 12. Chronophotographic studies of identical phases in walking of the normal (R.) and a cerebral palsied patient. The head and trunk of the brain damaged child are flexed and rotated to the left, the arms are abducted and carried stiffly in front of the body, giving the appearance of propulsion.

Figure 13. Two phases of walking of another patient with time intervals identical to those in the previous illustration.

widely differing builds. These are now under study and will be described elsewhere. By synchronizing photographic records with center of gravity observations, the stresses imposed by the stabilizer may be subjected to quantitative evaluation.

Analysis of Gait Patterns

It has been aptly said that all movement begins and ends in posture. Having elucidated some of the factors which influence the stance of the disabled subject, attention was next directed to ways and means of expediting the analysis of movement. Although moving pictures preserve specific action patterns and provide a method permitting repeated observation, they retain certain disadvantages inherent in direct inspection. Much can be gained by resorting to the simple expedient of breaking a movement cycle into a variable number of phases. These epitomize the distinguishing characteristics of the movement pattern under study. Without destroying the feeling of sequential progression, the high-lights of action may be caught and fixed in a single picture. Thus flexion

Figure 14. Similar chronophotographs of a more severely disabled patient. The time interval between figures is ten times that of the two preceding illustrations. The movement is initiated with difficulty and is characterized by little forward progression.

of the head, abduction of the arms, rotation of the trunk, and a high steppage gait are characteristic of the locomotion of the patients illustrated in Figures 12, 13 and 14. The figures were drawn from systematically selected moving picture frames enlarged by a microfilm reader. To date this chronophotographic technic has been applied to the analysis of other activities such as falling, getting out of a chair, and progression with various aids to locomotion. When the movement cycles thus fixed for purposes of analysis are interpreted in conjunction with center of gravity observations and muscle testing, they provide invaluable guides to program planning and objective criteria of progress.

References

1. Hellebrandt, Frances A., Doris Kubin, Winifred M. Longfield and L. E. A. Kelso: The Base of Support in Stance: Its Characteristics and the Influence of Shoes Upon the Location of the Center of Weight. Physiotherapy Rev. 17:231-234, Nov.-Dec., 1937; Hellebrandt, F. A. and E. Corinne Fries: The Constancy of Oscillographic Stance Patterns, ibid. 22:17-23, Jan.-Feb. 1942; Hellebrandt, F. A. and E. Corinne Fries: Eccentricity of the Mean Vertical Projection of the Center of Gravity During Standing, ibid. 22:186-192, July-Aug. 1942; E. Corinne Fries and F. A. Hellebrandt: The Influence of Pregnancy on the Center of Gravity, Postural Stability, and Body Alignment. Am. J. Obst. & Gynec., 46:374-380, Sept. 1943; Hellebrandt, F. A., Bette G. Nelson and Eleanor M. Larsen: The Eccentricity of Standing and Its Cause. Am. J. Physiol., 140:205-211, Nov. 1943; Hellebrandt, F. A., E. Corinne Fries, Eleanor M. Larsen and L. E. A. Kelso: The Influence of the Army Pack on Postural Stability and Stance Mechanics. Am. J. Physiol., 140:645-655, Feb. 1944.
2. Morton, Dudley J.: The Human Foot; Its Evolution, Physiology and Functional Disorders, Columbia University Press, New York, 1935.
3. Magnus, R.: Korperstellung, Julius Springer, Berlin, 1924; Some Results of Studies in the Physiology of Posture. Lancet, 104:531-536, Sept. 11, 1926; ibid. 104:585-588, Sept. 18, 1926; On the Cooperation and Interference of Reflexes from other Sense Organs with those of the Labyrinths. Laryngoscope, 36:701-712, Oct. 1926; de Kleijn, A.: Experimental Physiology of the Labyrinth. Proc. Roy. Soc. Med., Sec. Otol. 17:6-27, June 1924.
4. Kabat, Herman: Studies on Neuromuscular Dysfunction, XI: New Principles of Neuromuscular Reeducation. Permanente Foundation Med. Bull., 5:111-123, Nov. 1947; Central Mechanisms for Recovery of Neuromuscular Function. Science, 112:23-24, July 7, 1950.

The Treatment of Cerebral Palsy

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Treatment of any pathological syndrome is based upon an accurate diagnosis and as complete a knowledge of the abnormality as it is possible to obtain. This is true in cerebral palsy where the diagnosis may not be difficult, but where obtaining knowledge of the total picture is a lengthy process and requires the cooperation of several members of a team. A complete evaluation of the child is essential to each therapist whether physical, occupational, or speech, and should represent the sum total of the physical, mental, social and emotional spheres. In the selection of a child for admission to a treatment program two factors should be considered; mentality and parental cooperation. If intelligence is too defective little value will be derived from definitive therapy, and progress must then depend upon growth and development. If the treatment program is not followed through in the home, and the child is not given proper training, his chances for ultimate achievement are dim. If a long range view is taken, with employment as the ultimate objective, these two factors must be given equal weight with, at most, a sixty-forty deviation in either direction.

The physical therapist's plan of treatment begins with the testing of body mechanics, seeking first of all for contractures; present most often in the spastic and rigidity types but also found occasionally in the athetoid. A fixed routine of testing is not always possible, and adaptation should be made quickly, but all results should be recorded in some system of grading to insure a meaningful objectivity. Contractures are located most frequently in the following areas: In the lower extremities; heelcords, iliotibial bands, hamstrings, hip flexors, thigh adductors; in the upper extremities; in internal rotators, elbow flexors, pronators, wrist and finger flexors, thumb adductors and flexors. As these sites are being checked it should be noted particularly if there is a difference in mobility of the hips, together with shortening of the more mobile leg and prominence of the greater trochanter. These signs point to a subluxation or dislocation of the hip, probably associated with tight adductor. The back should be checked routinely for scoliosis due to poor sitting position.

Movement patterns should be watched closely and a judgment formed as to what extent they are limited by the contractures or overflow movements in the spastic. In the athetoid the tendency toward assumption of certain postures in the prone, supine, sitting, and standing positions together with control of eye movements and their influence on head control should be noted. A gross estimation of muscle strength, as exhibited in pattern movements such as flexion, extension and rotation is made for each bodily segment. Other factors to be noted are foot position, presence of deformity, sense of balance, both sitting and standing, degree of motor learning and attention span. Testing of basic functional activities of rolling, crawling, kneeling and walking complete the initial examination, with deviation from the normal carefully noted.

The setting up of a treatment program presupposes that there will be good cooperation in the home as the relatively few minutes spent with the child by the physical therapist does not begin to compare with that spent by the parents. Time is well utilized in outlining a program for the parents, repeating exercises, applying and checking braces and outlining a series of helpful activities. It must be remembered, however, that we are treating the child through play and just plain living as well as by work.

Treatment of the young infant has as its purpose the establishment of kinesthetic sense. Here the conditioning rhymes and exercises find their greatest usefulness, and should be continued only until such a time as the infant assists and is ready to put his muscle contractions to use. Motivation for reach, grasp and release, and for eye movements should be given early. Strengthening and control of neck and trunk can be begun in the first few weeks. Normal child developmental patterns such as rising on the hands from a prone position, pulling up and rolling, should be en-

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couraged. Getting the child in a sitting position with adequate support should be attempted consistent with chronological age and handicap. The home program should also include a great deal of speech motivation in the form of infant sounds of cooing, gurgling, lip smacking, tongue movements and feeding patterns for later use in speech training. A knowledge of the most likely sites of development of contractures is important, with particular attention paid to the over-development of the antagonists of these groups. Be assured that the baby is permitted freedom of movement. Oftentimes simply telling the mother to put the baby on the floor instead of in the stroller will accomplish remarkable results.

The spastic state is the result of removal of suppressor areas of the brain which normally govern nerve impulses to antigravity muscles. Released from control, these impulses keep in constant contraction those muscles which produce the familiar flexion-adduction pattern.

The purpose of treatment in the older spastic child is the production and maintenance of normal bodily alignment. This includes stretching of contractures and strengthening of muscle groups weakened by any of the above mentioned mechanisms. The child should have a daily period of training in basic functional activities unhampered by braces or other equipment. These include rolling over, standing on hands and knees, reciprocal crawling, kneeling and knee walking forward, backward and to the side. Specific muscle strengthening is best performed in the cooperative spastic child by synkinetic movements described more fully elsewhere in this volume. Those most frequently used are: resisted elbow extension for wrist and finger extension, elbow flexion for supination, neck and trunk extension for leg abduction, hip flexion for foot dorsiflexion and inversion and knee extension for foot eversion. An almost routine exercise for the spastic child is that for hip extension with the legs hanging over the edge of the table. This not only strengthens gluteus maximus and medius but also decreases spasticity in hip flexors and adductors. Movement can sometimes be initiated in previously non-contractive muscle groups by having the part act against mild resistance. Isolated muscle re-education as performed in poliomyelitis is seldom indicated in the brain injured individual; rather it is patterns of movement which should be trained. Just as soon as the part is able to be moved voluntarily, that movement should be put to use in some activity which has meaning to the child. Conversely, treatment which is done exclusively on the plinth will be disappointing. Nonhandicapped children grow and develop through play activities and children handicapped by cerebral palsy are no different. Muscles are strengthened and their function increased through the stimulation afforded by various forms of play. Training in balance should be a part of every treatment and may be accomplished with or without equipment. The achievement of walking may have to be reached by many gradations, always keeping in mind the end result of a gait as inconspicuous as possible with arms at the sides, swinging reciprocally with the legs and with the knees and hips extended. This ultimate objective should govern every treatment program.

Athetosis is caused by damage to the posture-suppressing basal ganglia. It is characterized by a filtering through of movements which tend to bring a body segment into a certain position.

The principle of treatment in the athetoid is to teach function in spite of involuntary movements. The long arduous process of teaching conscious relaxation will not bear fruit if the athetoid is caught in the middle of the street by a sudden change of the traffic light. He must know how to work through his athetosis efficiently to reach the other side of the street as quickly as possible. It is, rather, a dynamic relaxation which the athetoid requires, motivating him to perform an action which is antagonistic to the abnormal one. For example, if the arm is held in abduction and external rotation, a stimulus causing him to reach for an object will bring the arm into adduction, internal rotation and forward flexion. Here again the basic functional activities of rolling, crawling, kneeling and pulling up are emphasized. It may be found that in rolling, the action is best initiated by leading with the eyes, then rotating the head, flexing the leg, rotating the trunk and then the arm, thus using a spiral pattern. Head control in any position is often difficult to obtain, particularly when there is much extensor thrust. Anterior neck and abdominal strengthening and, above all, motivation for performance must be practiced consistently. Since the arms are always involved more than the legs in the athetoid it is well to begin early in training in a voluntary clasping of the hands in front. This is useful particularly in beginning standing. Restraint of both arms when working with other parts of the body, or one arm when working with the other will cut down tension. As the child is learning a movement a very mild resistance, or use of heavy equipment, will aid in cutting down involuntary movement.

Faulty development of, or damage to, areas governing balance, muscle tone and proprioception characterize the ataxic. There is often an associated tremor and nystagmus.

Principle of treatment in the ataxic is development of balance and the kinesthetic and proprioceptive sense. Much of the ataxic's progress is dependent upon growth and development. Teaching him muscle feel and various reactions to gravity by the use of mild resistance and weighted objects can hasten it. In the older, cooperative child a system of Fraenkel's exercises may prove beneficial.

During treatment the physical therapist should not forget that he is treating the whole child and, even though the patient may go from his department directly into other therapies, the therapist can contribute to them without detracting from his own work. Each therapist should know what the other is doing so that there is interlocking of the entire program. Many opportunities for initiation of reach, grasp, release, training in sensory perception, eye-hand coordination, and self-help activities will present themselves throughout the treatment period. There should be continual encouragement in participating in functional speech. Exercises in breathing control and strengthening the muscles of speech may be performed by the physical therapist as well as by the speech therapist. It should also be realized that the physical therapy program plays a vital part in the developing maturity of the child, improvement of his social attitudes and development of emotional control.

Bracing plays an important part in the treatment program in its utilization to prevent deformity, correct deformity, control strength, support weakness, and to put the child, or one of his bodily segments, into a position of function. Braces should be used judiciously and should be removed during some period of the day to allow free movement. Shoes may be considered a part of the bracing program and should at all times be well fitting, furnishing support where needed and correcting position. Crutches constitute an important step in the progress toward walking but not all cerebral palsied children are able to master them because of an apraxia. In these instances prolonged balance training and substitution of other pieces of functional equipment will have to suffice. A crutch program is usually started using the axillary type, progressing to Canadian crutches, Canadian canes, round top canes and, finally, to complete elimination of such support if possible. Care should be taken that hip flexion contractures do not develop and that the muscle strengthening program, which will lead to eventual discard of mechanical aids, is continued.

There are certain basic pieces of equipment which it is desirable to have in the cerebral palsy treatment program, but gadgets should not be overemphasized at the expense of trained hands and observing eyes. In so far as possible it is best to use articles which are a part of every day living, adapting them to the child at his particular stage of progress. A cradle gym placed in the crib is useful in stimulating reach, grasp and release, in developing focusing of the eyes, and eye-hand coordination. As soon as possible the child should be put into a high chair with plywood insets to give proper support, if needed, and with a foot rest built up so that the feet are pressed firmly against it. Toys should always be within easy reach of the tray. As the child grows older the chair may be changed, always keeping it as normal appearing as possible but making sure that adequate support is given and that position of function is maintained. It is well to inquire routinely if the child is left in a stroller for any length of time and, if so, it should be discarded as this device hinders movement, retards development of balance and induces valgus and tight iliotibial bands. A walker may be advantageous in certain carefully selected cases, but it should be used only for the child who is under close supervision since it too, if used injudiciously, may retard development of independent balance. The use of parallel bars and stall bars as an aid to walking and trunk control and strengthening is well known. The use of either may be difficult when there is a great deal of arm involvement. Pushing a chair or weighted doll carriage helps in development of balance and arm control. There are many pieces of play equipment which are useful in developing movement patterns. With ingenuity these can be adapted to suit nearly any handicapped child. A tricycle finds almost universal application and little motivation is needed for its use if proper attachments are added. The "Irish Mail" is an excellent developer of an extension pattern. Standing on a lawn swing and pumping sidewise brings out abductors hitherto undeveloped. The jungle gym stimulates balance, eye-hand coordination, foot placement, attracts neighborhood children and teaches independence. The sand pile is excellent for development of bimanual activities, supination and hand strength. The proper piece of equipment can be found in almost any toy shop, each combined with that most necessary article—motivation.

The development of the program of any child would not be complete if something were not said about recreation, as its socializing influence and its training in every day living and development of personality is just as important as is muscle training. Activities such as swimming, camping, dancing and scouting provide a much needed

association with nonhandicapped children as well as contribute to physical, social, and mental development. For those more severely handicapped, participation in group games from a wheel chair can serve the same purpose.

During each therapy period with the child two objectives should be kept in mind; the immediate, such as walking, speech, and self-help and, the ultimate, some form of vocational rehabilitation. Each therapist can serve in the field of prevocational exploration, recording the particular aptitudes and interests of the child and the relation of his handicap to them. The worth-whileness of intensive therapy throughout the growing period can be justified only if it means a richer life for the adult.

Speech Training for the Cerebral Palsied Child

Harold Westlake, Ph.D.

I. INTRODUCTION

Speech is one aspect of a complex language function which can be described in many ways. One way is to think of it as being made up of three divisions: 1) the sensory input; 2) the inner analysis of the input; 3) the formulation of a response or idea; and 4) the motoric expression of the inner language in some symbolic form as words or signs. All of the sensations have roles in the sensory input aspect of language, even pain or pressure sensations from within the body. However, in most of our language hearing and vision are the dominant media. The sensations which are received must be analyzed, so that two things are involved—simple reception or sensitivity to stimuli, and then the ability to interpret or use sensations. The various interpretations of the input stimuli must be synthesized within. Evaluations of immediate situations are tempered by past experiences so that considered ideas are formulated in an inner language. Then this inner language is patterned for a motoric interpretation which may take any of diverse forms: facial expression, gross activity, pantomime, simple grunts or sounds, or on a higher level, some form of written or oral language.

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Language behavior covers a wide range from something as simple as a baby's smiling, squirming, and flailing his arms and legs in anticipation of being picked up when a parent is seen standing over him, to complex use of symbolic language in a learned essay. In working with a child the teaching of sounds or words takes in only a small fragment of a complex process. The speech therapist must consider the total language function in its total scale of complexity. His task is to help a child to establish meaningful cantact with his environment, the broader goal being to develop communication in any form.

The acquisition of language in normal children has been studied by a large number of researchers. This emergence of oral language facility in normal children has many implications for the persons who work in cerebral palsy since it presents norms for evaluating the skills of the cerebral palsied child, and probably more important, it suggests a pattern of growth for this oral language skill which can guide a therapist in understanding and stimulating the speech efforts of the cerebral palsied child. Following is a selection of bits of information that have come from the study of normal speech development with interpretations of their possible importance for managing the cerebral palsied child.

II. Implications of Normal Speech Development

A baby's awareness of his environment begins on a very simple level. His early experiences with objects which are placed in his hands or before him come from grasping them and usually exploring them further by raising them to his mouth. He starts to watch objects that are held up before him and persons who are near him. He responds to petting and talking by smiling and making small sounds of his own. These are the beginnings of an interaction with his environment, and as such they must be encouraged as a start in the unfolding of the communicative process.

The cerebral palsied child will have more difficulty in closing his hands on objects, in getting them up to his mouth, and in fixing his eyes on persons and things. He must have help in exploring objects which should be placed in his hands, brought to his mouth, and displayed within his limited field of vision. At a very early age he is sensitive to affection, attention, and approval so that when he smiles or makes an accidental sound he should be rewarded with more pleasurable attention, and thus gradually taught that these things are worth doing since they are ways by which he can attract and hold adult attention.

The average child has a rich experience with vocal play or experimental sound which gradually merges into meaningful speech. In contrast, the cerebral palsied child is inclined to be a silent baby. For those who make little sound, or weak sounds, stimulating any sort of vocal response has special importance since it furnishes good functional training for phonation. The initial effort should not be to get particular sounds from the child, but to help him to gain satisfaction from making any sound and as much sound as he can make. When he accidentally produces an interesting variation of this sound, reward him by special attention and repeat the sound that he made for him. The situation should be permissive and encouraging, but he must "go his own way" vocally at this stage.

It is generally held that the first words are accidental likenesses to sounds adults use as words. These "words" probably have no meaning for the child, but the excessive pleasure of the parent is sufficient reason for uttering them again. The meanings of the words are learned from the adults at a later time. Adult approval and attention are probably almost as important as a child's own development in establishing first words.

These first words are usually dubious approximations of those the parent interprets. The best answer to the question "When does a child learn to talk?" is probably "When the parent thinks he does." Recently the writer examined the baby book of a mother who claimed that her child had had thirty words at the age of one year. She had written such things as "ba" as meaning "no" and "ugh" as meaning "toilet." Another parent said that her child had no speech when a clinician felt that he was ready to use quite a few words. For all practical purposes the first child was talking and the second was not. The difference lay more in parental attitudes than in variations in the babies.

There is no doubt but that the parent who "reaches out" to the youngster encourages speech learning, whereas the child whose first efforts fall into a vacuum has a difficult time. Possibly the essential difference between the first words of the normal child and those of most cerebral palsied children is that because of the motor problem, the cerebral palsied child's first words are apt to be less like the way the grownup says them, so that it is necessary for the parents to try harder to make something out of what he says. They must search more thoroughly for expressions or movements which can have meaning. Giving value or meaning to any gesture or signal the child may use makes the difference between a youngster who is starting to communicate and one who is learning to get along without language.

In the vocal play as well as in the first meaningful speech a child uses the vowels predominantly. By the age of thirty months the child has usually developed all of the vowels he will use later, but only about two-thirds of the consonants he will use as an adult. The back consonants ("k," "g," and "h") dominate the early period. The lip and tip of the tongue sounds start to come in at the end of the first year. The above observations on normal children are in keeping with what therapists report on cerebral palsied children in whom back of the tongue function is more apt to be present before or acquired before activity of the tongue tip or lips. It appears that with the cerebral palsied children, whose motor functions will lag behind those of normal children, it may be necessary at first to accept vowels for approximations of first words, and substitutions of back consonants for tip of the tongue consonants ("t," "d," "n," "l," etc.).

The usual thing is for a child to acquire one or two words in the first year. In the second year he uses single words when he thinks a whole sentence, as when he says "Car" while he means "I want to go for a ride." Toward the end of the second year he is combining words for two-word

statements and in the third year he uses three-word statements. The precision of consonantal sounds, especially the blends, as "sl," "sk," "str," etc., gradually improves and the vocabulary expands. The normal child is usually seven and one half or eight years of age before he may be expected to be completely accurate with all of the sound elements. The "f," "v," whispered "th," voiced "th," "z," "l," and "r" and their combinations or blends are the last to be used correctly.

It is reasonable to expect that the order of events by which the cerebral palsied child will communicate will not be too unlike that followed by the normal child, although the progress of the cerebral palsied child will ordinarily be slower. Certainly one should not expect to train a type of speech response in a child who has a motor handicap at an earlier age than a normal child may be expected to acquire the same skill.

The above selection of information on normal development and its interpretation is presented as a basis for surrounding the cerebral palsied child with an understanding and receptive environment in which oral communication will have its best opportunity for development. It is a major part of good teaching to work with the family, the home, and all other therapists so that they can be resources for stimulating and utilizing the child's potentials for communication. Important as this may be, however, a more positive approach is necessary to get acceptable speech from most cerebral palsied children. A first step in such a positive approach is to find where a child stands in his development of communication. What are his potentials? What are his deficits?

III. Speech Evaluation

The speech evaluation consists of an exploration of the sensory input, the ability to use sensation, the inner language, and the output or expressive language. Since motor disability is inherent in the definition of cerebral palsy, the particular nature of the motor involvement as it affects speech must be studied. Further observation must be made as to how emotional adjustment or lack of opportunity has affected the language achievement. Although it would be logical to start with sensory input and to proceed in the order given above, it is usually practical in the clinical situation to evaluate the expressive language first since it is the easiest part to assess, and since the type of response obtained suggests the level of the testing to be used in the rest of the examination.

1. *Expressive Language.*

Find out by talking with the child and the parent how much speech the child has. If the child does talk, a parent's statement as to whether he has five words, ten words, twenty words, or names "for everything" is usually quite reliable. When there is an appreciable vocabulary present, make a phonetic analysis of these words in which you list and classify the sounds and speech movements that can be made and those that are not made. Find out how the words are used. Are they used spontaneously and purposefully, or are they simply repeated after an adult or used in an artificial way when a parent forces a situation so that they have little communicative value. Another way of expressing this same idea is to observe whether the words express more than a child actually has in mind or does he have ideas that he is struggling to express through an inadequate vocabulary?

When there are few or no intelligible words present, it is necessary to probe other avenues of expression. Is voice used in any way to get attention? Are grunts and sounds used to express ideas to the parent? Do facial expressions, signs, or any movements have meaning values for the family? Is active communication entirely lacking?

2. *Sensory Input.*

A. How does the child use his vision? Does he watch things that are placed within his range of vision? Will he follow objects as they are moved through his field of vision? Does he select particular objects and "reach for them" and explore them with his eyes? Does he react in a special way to a parent or stranger who comes near him? Does he show an interest in other children and follow their play activities? Can he interpret visual clues, such as realizing that the appearance of food means eating; that bringing his coat means that he is going out; or that his mother's putting on her coat means that she is going out? Does he react empathically to what he sees, showing excitement as other children are excited; sorrow when they cry; or fear when they are scolded? Does he react to absurdities he may see, such as a person's trying to eat with a spoon held upsidedown; putting a shoe on a doll's head; or setting a doll in a chair upsidedown?

B. Does the child hear? If a child is mature enough in his insight and behavior, hearing should be explored, using a pure tone audiometer by which it is possible to determine just how much energy (loudness) tones of varying fre-

quency (pitch) must have before they are heard. With young and immature children more functional ways must be used to judge the sensitivity of the ear.

One of the grossest tests is to make any loud sound such as to crash cymbals, strike a pan, or blow a loud whistle behind him and to watch for the startle pattern as an indication of hearing. A number of clickers, bells, rattles, and other noise makers of varying pitches and loudnesses can be used to see if the child shows a reaction to the sounds by appearing to attend to them or trying to locate them.

The ability to hear voices is tested by calling to him. Ordinarily the children respond better to the familiar voices of members of the family than to those of strange clinicians. One way of making the voices important and thus increasing the probability of a response is to obviously take the child away from the parents so he can see that they are being separated. Then after a lapse of time bring him back to his parents, holding him so that he can't see them and having them call to him in soft voices. The response of a small child can often be felt better than it can be observed as he tenses in recognition of the familiar sound.

C. Can the child use his hearing? Being aware of sound and being able to use sound are two separate things. A brain-damaged child may have acute hearing and still not be able to make use of this hearing in his learning. Following simple commands is one way to show that speech is understood. Since the cerebral palsied child is motorically limited the commands must be simple, as asking him to look at familiar persons in a room, or at familiar objects arranged so they are visible to him. His ability to interpret language can be tested further by watching his response to conversation about members of his family, his pets, or favorite toys. On a higher level, a sustained interest in stories or radio programs indicate successful use of hearing.

3. *Inner Language.*

The use of inner language is hypothecated on the basis of a child's ability to see relationships, to solve problems, and to show insight in his behavior. To a degree the suggested ways by which a child might show his ability to use sound and vision also reveal a certain amount of inner language. Likewise the use of any words or signs to express ideas show some inner formulation which is being represented by the language behavior the parents accept and understand. Obviously any success in using language as a tool is going to be dependent upon the level of inner language present. Through observing the child and questioning the parents regarding the interactions in the home environment the clinician can come up with at least tentative conclusions as to whether speech training is warranted. The psychologist's evaluation is a critical part of the assessment of this area.

4. *The Motor Disability and Its Effect Upon Speech.*

The output phase of oral language is largely dependent upon the neuromuscular efficiency of the speech mechanism. A careful evaluation of specific muscles and essential patterns of activity is of prime importance. Just as the physical therapist analyzes a walking pattern in terms of specific parts of it, as head balance, sitting balance, etc., the speech therapist can isolate separate phases of the speaking act in order to see what must be done to achieve physiological readiness for speech. Following is a defensible breakdown of the motoric skills that would successfully support the speaking act:

A. *Breathing.* A breathing rate should not be in excess of 25 breaths per minute and an even exhalation should be sustained for a minimum of 10 seconds.

B. *Phonation.* Tone should be initiated easily and a steady tone should be maintained for 10 seconds.

C. *Opening and closing the mouth.* There should be an ability to open and close the mouth a minimum of 10 times in 10 seconds. In this phase it is expected that the lips, tongue, and jaw will move together and no particular attention is paid to how each part acts during the opening and closing of the mouth.

D. *Selective activity of the tongue.*

1. The tongue should be extended between the lips and retracted at least 5 times in 10 seconds.

2. The tongue should be moved laterally from one corner of the lips to the opposite corner 10 times in 10 seconds.

3. When the jaws are stabilized by placing a rubber block about a quarter of an inch thick between the molars, the tip of the tongue should be elevated to the rugae at least 10 times in 10 seconds.

E. *Selective activity of the lips.*

1. When the jaws are stabilized by holding the upper and lower molars in light contact, the lips should be separated and brought together again 10 times in 10 seconds.

2. Stabilizing the jaws in the same way, the corners of the mouth should be extended laterally and then drawn medially so that the lips are puckered at least 5 times in 10 seconds.

F. *Peristaltic activity of the tongue.* The peristaltic activity of the tongue is the movement by which food is propelled from the front of the mouth to the back of the mouth where it is swallowed. This pattern should be efficient as a support for adequate speaking skill.

Again it is stated that the above fractionation of the speaking act is an arbitrary one, but nevertheless, a useful one. The rates of movement are also arbitrary, being far below the normal rates. They may be defended as minimal requirements for intelligible, continuous speech. They can serve as reference points against which rates, determined at the time of examination and at subsequent stages in the training, can be graphed.

In determining the physiological readiness for speech the clinician should observe how the above activities are performed both in vegetative or reflex activity and in purposeful or "willed" activity. The cerebral palsied child's ability to perform any one of these acts reflexively does not mean that he can accomplish the same act voluntarily, i.e., he may be able to vocalize freely when he laughs or cries and still not be able to utter a sound when he consciously "wills" to do it. If an act can be performed reflexively there is a good chance that it can be incorporated later into functional language.

With older and more mature children, whose insight and cooperation are better, it is possible to time the performances and record numerical ratings for the various movements. With younger children the different activities can only be given such qualitative ratings as "trace, slow, etc." through observation of their eating, drinking, and playing.

Having sampled a number of areas of functioning in the speech evaluation, the therapist can make comparisons of types of response. If, for instance, vision is used successfully, and there is obvious inner language but there is no use of auditory clues, there is a presumption that hearing is at fault. It may be reduced acuity or an inability to interpret sound as determined by the behavior in the hearing tests. The clinician should make an over-all judgment by such comparisons to see whether the child is uniformly handicapped in all areas or if he functions quite well in some respects but has definite deficits in others. The over-all judgment should take into account the possibility that lack of stimulation or opportunity or emotional problems could possibly explain poor achievement. The training program is in a sense a tailored program to meet the needs of the particular child.

IV. THE LANGUAGE TRAINING

1. *Increasing the use of the sensory input.* One of the most frequent needs in this regard is to encourage the parents to increase the number of opportunities that are appropriate for the interest level of the child. Parents underestimate as well as overestimate a youngster's readiness to profit from particular types of experiences, and even the best cared for children usually have not observed such things as peeling a banana or an orange, or felt rain or snow on their faces, or were permitted to dangle their feet in the water as they watched other children wade. Using a background of experience with normal children and normal child development, the therapist should direct the parent in expanding the environment by opportunities to observe and to participate vicariously in activities that are on a suitable level.

There is always a question of how the sensory functions of a cerebral palsied child are affected by the same central damage that has resulted in motor inefficiency. It has been established that they are more apt to have impaired hearing and visual acuity than the normal child. There is reason to believe that their taste, feeling, and kinesthetic sensation are also affected.

Tests of vision, hearing, and other sensations in as far as they can be evaluated, are of prime importance in assessing the educational needs and in selecting training technics. However, an apparent lack of response to sensation of any kind cannot be immediately interpreted as a real impairment. The writer's experience in testing the hearing of these children has strongly indicated that they often act as though they do not hear when the real problem is not deafness but a lack of ability to use sound. This particular problem is called sensory perception.

Persons having intact nervous systems have an ability to focus attention in vision, hearing, and other sensation. That is, presented with the usual complex mass of detail that meets the eye in an ordinary picture, or a table holding several objects, they can attend to and recognize particular objects instead of being confused by the total barrage of sensation. In a picture they might recognize the shape of a man, and accept such details as shrubbery or sky as appropriate background which does

not detract from the ability to attend to the man. Applying the same situation to hearing the normal persons can concentrate on speech and show considerable ability to follow it even though there may be many other sounds in the room at the same time.

In contrast, the brain-damaged child may lack this ability to select important visual and auditory clues from the background. Being unable to interpret his surroundings he does not learn to use sensation, and behaves as though he is deficient in sensory acuity.

The recommended procedure is to help him structure or organize his perception of his environment. This would be done by presenting single, sharp sensations. When he is given the names of objects, it is useful to have only the object named within his range of vision while its name is pronounced clearly. The room in which the teaching is done should be quiet, and during the training periods he should work facing a plain wall preferably of the same color as the table top or lap board on which he is working. The "cheesecake" affect of having colorful equipment all about is very distracting and detrimental to the learning. Pictures that are used should be sharp and clear in outline with only essential details and no background. Critical parts of the pictures can be outlined as they are named or described.

In this controlled situation he should be given simple experiences to acquaint him with environmental sounds, language, simple pictures and simple objects. He should be given experiences with things that are round, hard, soft, rough, sharp, cool, etc. Plastic figures of persons and home furnishings can be presented singly and in meaningful relationship, as having a figure of a boy seated on a chair. With all of this demonstration pertinent speech and sound are presented simply and clearly.

The importance of these isolating and limiting aspects of training sessions does not mean that he should be insulated all during the day. To the contrary every effort should be made to give him as rich an experimental and social environment as possible. The training in isolation helps him to interpret the normal surroundings.

2. *Using inner language.* The inner language function is usually considered as a basic and endowed capacity that cannot be improved beyond the native ability of the person. With increased experience and wider opportunities to react the child's use of inner language can be increased, but he is probably only then starting to make use of latent capacity rather than developing capacity.

An important part of increasing inner reactivity is to increase a child's feeling of "self." The concept of "selfness" or "separateness" develops in a child as he becomes less dependent upon adults. Even though a child's crippling condition may prevent him from actually taking care of his personal needs, he can gain the feeling of an independent being by being trained to signal when he needs personal care as tooth brushing, etc. The child who is held responsible for initiating attention to his needs is operating on a higher level than one who has all of these things "done to" him, so that he is treated as an appendage of the mother rather than as a free citizen. Even the way adults talk to cerebral palsied children sometimes enslaves them. People unconsciously limit their conversations to expressions that have an emotional or "cuddling" effect rather than talking in a natural way as though the cerebral palsied child shared interests and experiences.

As stated above, probably nothing more can be done with inner language than to accept the cerebral palsy condition and to treat the child in a way that permits the development of individual status so that within his abilities he will feel the need and importance of reacting to his environment.

3. *Language output.* Throughout the paper suggestions have been made for the development of expressive language from early stimulation of vocal play; the gradual increase in the amount and kinds of babbling sounds; and from this the emergence of accidental approximations of words whose meanings are taught to the children by the adult's repeated acceptance of them as bona fide words. Nonvocal signs and signals are likewise accepted and given symbol value. It is the hope to increase the precision of the inaccurate first words through repeated use.

Inherent in the diagnosis of the cerebral palsied condition is a motor disability. One of the most challenging and rewarding points of emphasis in the training of most children is to follow a rigorous program of motor learning to develop the neuromuscular patterns that support the speaking act. The technics used by the speech therapist in muscle testing and education in this phase of the work are chiefly adaptations of procedures worked out by medical consultants, occupational therapists, and physical therapists. These other therapies have preceded speech therapy in the field of cerebral palsy, and the speech therapists are indebted for their imaginative and systematic approaches.

Following the leadership of the other workers, the speech therapists have applied procedures for utilizing passive activity, resisted motion, stabiliza-

tion, bracing, synkinetic movements and pattern development, to the speech mechanism. They have developed equipment and procedures to implement this work. Since the common ground of the physical therapist and the speech therapist is in the muscle training, it would probably have been most appropriate if this article had emphasized that approach. However, the writer has recently written several articles on this aspect, so it seemed better to present a broad overview of the speech therapists' approach, and to refer in the bibliography to sources of practical information on details of training.

In closing, reference is made again to the base of "communication" rather than "articulate speech" from which the speech therapist operates. Just as there are persons who never develop functional walking in spite of years of therapy, there are cerebral palsied persons whose motor involvements are so severe that articulate speech is so labored and accompanied by so many extraneous movements that it is not an acceptable social tool. For them the best other expressive medium must be developed. It may be typing or even the use of a conversation board. Whatever the medium of expressive language is, it should be the one most appropriate for the individual.

BIBLIOGRAPHY

1. Case, M. Speech Habilitation in Cerebral Palsy. New York: Columbia University Press, 1951.
2. Palmer, M. Normalization of Chewing, Sucking and Swallowing Reflexes in Cerebral Palsy, Journal of Speech Disorders, Vol. 5, 1940.
3. Rutherford, B. Give Them a Chance to Talk. Minneapolis: Burgess, 1948.
4. Strauss and Lehtmen, The Brain-Injured Child. New York: Grune and Stratton, 1947.
5. Van Riper, C. Speech Correction. New York: Prentice-Hall, 1947.
6. Westlake, H. A System for Developing Speech with Cerebral Palsied Children. The Crippled Child, XXIX, 1, 2, 3, 4.

Balance and Walking in the Treatment of Cerebral Palsy

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Cerebral Palsy designates a group of neuromuscular disorders in which, due to a congenital or acquired brain lesion, there is impairment or loss of muscular control. Two factors fundamentally wrong with the cerebral palsied child are his inability to control his muscles and a lack of balance. The ultimate goal in training patterns for locomotion is walking in which balance and movement are the two processes involved. The body is stabilized upright by certain muscles, and is propelled forward by other muscles. Normally these abilities are closely related so that the child, on the average, is standing alone at 14 months, and is walking unassisted at 15 months; thus, balance and the walking pattern come together usually from 12 to 15 months. In many children with cerebral palsy these two processes develop at different rates, and each process requires specific management. Usually present by the age of one year are walking movements. Balance is delayed and may not be established until 4 or 5 years of age or as late as the age of 10 or 12, and all this time, lying dormant, has been the ability to walk. Of the most vital importance in the entire treatment program is this critical problem of preserving and developing the walking pattern until balance arrives. Balance also may be considered as an automatic function usually controlled by three mechanisms—the eyes, cerebellum (8th nerve) and semicircular canal. One or more of these may be disturbed. The child may be thrown off balance by lack of muscle control in directing planned movements, or in inhibiting muscle activity, or an exaggeration of the balance attempt (as with the cerebellar release athetoid). Muscle weakness in the neck and trunk acts as a secondary balance loss. Muscle strength, muscle control, and relaxation are necessary in the proper proportion.

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In training balance and walking, *drugs*, *braces*, *muscle stretching*, and *surgery* are aids to the very important *neuromuscular training* and *building of developmental patterns*.

There is no indication that the *drugs* now under consideration are a substitute for training. Drugs will only ameliorate abnormal mechanisms. They are helpful in some cases and valueless in others. Control cases in the use of muscle relaxing drugs show spasticity and involuntary motion reduction, but some interference of voluntary control. There is a drug which for acquired athetosis releases previously known patterns of motion, but is of little value in new learning. Drugging the cerebellar release athetoid has only a temporary effect, but may give opportunity to learn the balancing skill with the overactive impulses decreased by the drug. Medication in the form of vitamins is important, as many cerebral palsied children are poorly nourished and suffer from vitamin deficiencies. Athetoids have high caloric and vitamin requirements because of the energy used by their excess motions.

Braces in their many purposes are for control in ruling out some joint actions while learning control of others; control of involuntary muscle pulls which tend to throw a child off balance; practice of good body alignment for extended periods of time; prevention of deformities and contractures; support where muscles are too weak to maintain the patient in the standing position—thus increasing sitting and standing stability; aid in locomotion and the laying-in of patterns of motion. The scissors gait requires the full control brace in order to practice walking. Full control bracing until walking is attained, is the preventive bracing for femoral-tibial torsion. After eight or nine years of bracing, the pattern carries over and the walk may be entirely taught. The night brace for the shortened heel cord, an important factor in balance and walking, must be worn throughout the growth period or approximately until the child is seventeen years old. There is then no further tendency for contracture to occur, and the patient will have an absolutely normal gait when the bone of the leg has attained full growth. A full metal plate is needed in the shoe sole to prevent plantar flexion power leading to a forefoot drop, and foot position (pronation or supination tendencies) must be considered in determining the medial or lateral placement of the T strap and the single bar. On a day brace, a double stop at the ankle may give added stability in balance work. A buttocks pad added to a body brace may be of use in the hip flexion tendency.

Since surgery in the growing child under twelve may be undesirable, *muscle stretching* may be done as a temporary procedure. This is of value in some cases and may aid in the training of the opposite muscle. When a spastic muscle is made longer, the stretch reflex and its changed threshold are placed at a mechanical disadvantage. Results have been good in heel cord stretching under anesthesia, with some patients needing no restretching within a two-year period, and others finding permanent contracture relief. The first stretching can secure a moderate release and relaxation, and can be retained by application of the cast for one month. Stretching on the second occasion and the part kept elongated by means of a plaster cast for six weeks, may secure satisfactory and often full muscle elongation. Following cast removal, training is resumed. Calf muscles, hip adductors, and internal rotators respond to this stretching; hip and knee flexors vary in response.

Surgery is helpful in some cases and valueless in others. Surgical measures may be supplemented by splints to maintain the corrected position. Dr. O. Foerster in 1911 introduced the severing of sensory nerve roots at the spinal cord to abolish reflex spastic muscle contractions. Dr. Adolf Stoffel in 1913 introduced an operation to reduce spasticity by severing part of the motor nerve to the muscle, thus reducing the power of the overacting muscle. The results have ranged from highly satisfactory to a perverse and surprising re-innervation. There are also joint stabilizations, and muscle transplants and tendon operations to relieve contractures and deformities. Deformities due to actual muscle shortening rather than mere hypertonicity must be determined. Crossed leg or thigh adduction, disappearing with the child lying relaxed on the examining table, seldom indicates a muscle releasing operation. Surgery on the thigh adductors at the pubis to relieve adduction of knee flexion, on the hamstring tendons to relieve knee flexion, and on the Achilles tendon to relieve equinus are the principal muscle deformity operations.

In order to consolidate muscular contractions into useful and practical activities, the treatment of cerebral palsy must be based on the securing of muscular relaxation and voluntary muscular control by *neuromuscular training* and by the *building of developmental patterns*. Complete relaxation, passive exercise, active assistive and active exercise (the latter comprising by far the greatest part of the re-education program) are devoted to the teaching of sitting, standing, and walking by means of constant practice, as well as by re-education of individual muscles or groups of muscles

in single motions. Other modalities of use are massage, resisted motion, conditioned motion, rest, motion from the relaxed position, reciprocation, hand movements (reach, grasp, and release), and skills. In the use of the modalities mentioned, and of the certain fundamental pieces of ejuipment that are indispensable to a well organized activity plan, it is well for both patient and physical therapist to keep in mind Dr. Arthur Steindler's statement that "skillful or perfect motion involves the least expenditure of effort while unskillful motion requires much more." In the several progression methods toward obtaining balance and walking, the steps selected are those which best meet the needs and abilities of the individual child. Training in balance response should be given as early as possible and not necessarily postponed until each step of a progression series is conquered. Not every child will need to pass through each step of progress, but he will need sitting balance before he can stand, and walking reciprocation and standing balance before he can walk. The child will not stand or walk unless he is given an opportunity to develop enough strength in his feet and legs to maintain body weight, and therefore he should be placed in braces to accustom him to the upright position with his weight on his feet. This is a morale builder and, in general, the younger the child is, the less fear he has of falling. As a check on progress it is important that practice be given where possible with and without braces, with and without equipment, in varied situations and functional activities.

The locomotion training guide follows basically the progress of the normal newborn from simple movement to rolling over, crawling, creeping on hands and knees, coming to a standing position, standing alone and finally walking alone. Where the lower extremity leads, practice in rolling over is for strengthening and coordinating the lower trunk, pelvis, and thigh muscles. Where the shoulders lead, the shoulder extension muscles are developed by rolling from the prone position. This rolling process is directly related to the activities of creeping and other forward movements.

Head and trunk control is important for balance in sitting, standing, and walking. In anterior neck and trunk strengthening, a desired movement is to flex the body from supine to the sitting position. Three units are involved in the process of sitting up: 1) Flexion of the head and neck, 2) Trunk flexion, 3) Flexion of the pelvis at the hips. In (1) head and neck flexion training, the child is supine, shoulders resting firmly on the table, head (beyond the table edge) supported by the physical therapist's hands. This position presents the head in normal alignment as it is in standing, and secures the best action of the sternomastoid muscle. If the head rests on the table, satisfactory contraction of this muscle is prevented, as the head is forced forward by the posterior convexity of the cranium and the muscles are not in their full resting length. Maximum relaxation, then proper contraction, are the objectives. In (2) trunk flexion the supine patient has his upper back or occiput (if he is unable to hold up the head) supported by the physical therapist, and then contraction of the abdominal muscles is learned. The correct action is flexion of the upper trunk on the lower trunk contracting the rectus abdominis from its upper extremity. In (3) flexion of the pelvis at the hips, contraction of the abdominal muscles brings the child to a partially sitting position from which position the iliopsoas brings the child to the full sitting position. The movement is guided and assisted by the physical therapist. Posterior neck and trunk muscle control are also important for balance in the upright position. The three units in posterior body action are: 1) Head extension, 2) Scapulae adduction, 3) Spine extension. In (1) head extension the child is prone in normal body alignment, shoulders resting on the table's edge, and the head (off the table as before) supported by the physical therapist's hands. Maximum relaxation, active assistive, and then active head extension comprise the training sequence. In (2) scapulae adduction, important in counteracting contracture of the pectoral muscles and cupped shoulders (a serious deterrent to establishing control of balance), palpation of the pectoral muscles of the prone child acquaints the patient with the contracted condition. To secure maximum relaxation of the pectoral and other shoulder girdle muscles, the shoulders are moved backward. Next the patient's attention is focused on the rhomboid group insertion on the vertebral border, and passive, active assistive, and active movement leads to individual and then simultaneous shoulder action. Neither the upper trapezius (elevating the shoulders toward the ears) nor the opposite pectorals (attempting to rotate the scapula forward) must interfere with the rhomboid action. In (3) extension of the spine, relaxation precedes upper spine extension by contraction of the spinal muscles (in prone position). Contraction of the pectoral muscles or raising the body by pushing the shoulders against the table is incorrect. The physical therapist supports the upper chest with one hand and the thighs with the other. The patient adducts the scapulae, extends neck and upper back and at the same time extends the lower spine.

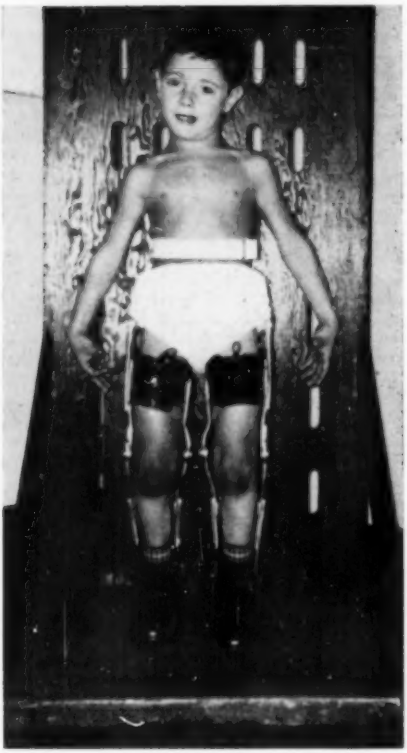

Fig. 1. Standing Board: Assists in neck, trunk, leg control and strengthening—deformity prevention—giving a kinesthetic sense of the upright position —practice of body alignment.

To develop sitting balance the child should sit cross-legged on the table tailor fashion, with sandbag supports around the trunk and on top of the median aspects of the knees, or with braced legs over the table edge, and sandbag support around the trunk and across the thighs. Trunk supports should be as high as needed to enable the child to raise his head. In these positions, lowered support, disturbed sitting, release of spring uprights, then complete removal of sandbag support form a progressive balance practice series. When the child can sit on the table unaided, he should be placed in a regular chair. The normal baby balances his head in sitting and standing; in the cerebral palsied child, these muscles are weak from disuse, as are also hip and lateral trunk muscles so important for weight bearing in kneeling, standing, and walking.

Control of trunk and pelvis as well as head is necessary in crawling (the next step in progression from rolling over). Elevation or lifting the body into the air and supporting it on four limbs normally precedes creeping. Raising half the body at a time may be necessary—first the lower extremities or the legs under the trunk to a knee-chest position, then the head and trunk by pushing with the hands. Practice is given in contracting and releasing abdominal muscles, and arching the back slightly. The head should be in alignment with the trunk. In creeping, the proper pattern of weight shifting from four point to three point support, alternately lifting one limb at a time from the ground, is important. It is the sequence followed in teaching all walking activities and is important in balance.

Knee standing, or two point support, requires contracture of the posterior spinal muscles and pelvic extensors. Kneeling-walking consists of shifting weight to one knee and of taking a step forward with the opposite knee. Any tendency to adopt this as a locomotion form would mean that a minimum time should be spent in this position. Usually, this training of rolling over, crawling, creeping and kneeling is started on a mat to protect the child in case of falling. Cupping the shoulders forward is a serious deterrent to establishing balance control, and this position interferes with the action of the posterior muscles. After palpation and then relaxation of these pectoral muscles, the child actively pulls his shoulders backward from the vertebral margin of the scapulae. This shoulder action should be practiced with the child in prone position on the plinth and also in sitting position. In spine extension (previously mentioned), after control of the component parts has been taught, the entire extensor group can be exercised. The physical therapist supports the upper chest with one hand and the thighs with the other. Scapulae adduction, neck and upper back extension, and lower spine extension all at the same time are done by the prone patient. The principal role of the quadratus lumborum muscle is to stabilize the trunk upon the pelvis in the lateral plane, an extremely important action in walking. Substitution by the abdominal muscle should be avoided by training the action of the quadratus lumborum muscle with the child in prone position.

After kneeling balance comes standing balance. In dealing with proper stance, the child is placed firmly on his feet with his weight borne equally on each leg, with the knees slightly flexed, trunk erect, and heels to the ground. Any tendency to raise the arms or contract the shoulders as aid to balance must be eliminated. The physical therapist pushes him into the mat slightly by pressure at the shoulders, or by grasping the pelvis to give leg weight-bearing sense. To stimulate the righting reflex, he is gently pushed off center slightly in various directions. The pull of abdominal muscles versus spinal and hip extensors, and of the foot dorsiflexors versus plantar flexors in balancing are explained and demonstrated. Of use here, and earlier in the training, are the standing board and the stabilizer. The standing board *(Fig. 1)* may assist neck, trunk, and leg strengthening and control, and deformity prevention, and may give kinesthetic sense of the upright position. More support may be given than is shown in the figure here, by adding strap support for the legs, shoulders, or head as needed. The stabilizer *(Fig. 2)* is of use in lateral trunk strengthening and trunk balance. Used in front of the mirror, the child can see his own head and trunk position. The stabilizer should be as high as possible on the thighs, with the braces locked at the hips and knees. Progression occurs as the stabilizer is lowered, spring uprights unfastened, and hips and knees unlocked. Body alignment is of great importance here.

Rising to standing is a necessary preliminary to walking. In order to strengthen muscles and to discourage the patient from learning to balance by pulling against a fixed support, it is preferable to teach the child to rise to standing by action of the leg muscles. This depends upon teaching him to balance first in the crouch or squat position. With the feet beneath the trunk and placed flat, the body weight is poised directly above, and the hands placed on the floor slightly ahead of the body merely to aid in balancing. After practicing lifting his hands, the child begins to rise, and extends his knees by contracting the quadriceps muscles, extends thighs by hamstring muscle action, and finally he has an upright trunk by proper use of the spinal extensor muscles.

In learning the walking pattern, the child practices shifting the weight of the body from one side to the other. To shift to the right leg, he moves the trunk slightly to the right and places his weight directly on that leg. He then bends the left knee slightly, causing the hip to flex and the heel to lift from the floor, and is then in stepping position. Stepping forward entails hip, knee and ankle action. Hip extension action is important in maintaining upright posture both in standing and walking. The thigh carried into hyperextension entails stabilizing the thigh to the pelvis, and pelvis to the trunk. To further aid the child in understanding this action, he may lie prone with his knee supported by the physical therapist. The therapist then indicates the attachment of the biceps femoris at the ischial tuberosity for hip extension, of the gluteus maximus to stabilize the thigh to the pelvis, then the iliocostalis lumborum muscle to stabilize the pelvis to the trunk. In walking, reciprocation is exercised by contracting flexor and extensor antagonists. As the flexors of one leg come into action, the extensors of the other leg contract simultaneously to stabilize and propel the body forward. Repetitive exercise best trains re-

Fig. 2. Stabilizer: Assists in lateral trunk balance and strengthening—giving a kinesthetic sense of the upright position—practice of body alignment.

Fig. 3. Reciprocal Motion Skis: Assists in teaching balance while in motion—and the reciprocal pattern of walking.

Fig. 4. Parallel Bars: Proper use gives practice in balance (anterior-posterior and lateral)—and walking reciprocation.

ciprocal motion in the lower extremities. Tension generally should be disregarded, and the parts should be forced through the walking pattern.

Skis with poles teach leg reciprocation, interior-posterior balance, and strengthen trunk and leg muscles following a passive, active assistive, and active exercise pattern basis. This piece of equipment also assists in training lateral balance, foot dorsiflexion, general strengthening and endurance. Stationary skis without poles assist in total body balance, especially anterior-posterior, with the play between the dorsiflexors and plantar flexors of the foot. To start total standing balance, if the child is in full-control braces with spring uprights, it is only necessary to learn plantar flexion against falling forward, and dorsiflexion and abdominal contraction against falling backward. Here progression occurs in releasing the spring uprights, then unlocking the hips. As an aid to lateral and anterior-posterior balance, modified skis are fine for athetoids who cannot handle crutches. Balance is required as the child can fall forward, but not backward.

Reciprocal motion skis *(Fig. 3)* after anterior-posterior balance is started, assist the teaching of balance while in motion, and the teaching of the reciprocal pattern of walking. In training the child to distribute his body weight properly, he is taught to balance the upper right quadrant over the lower left quadrant, the upper left quadrant

Fig. 5. Adjustable Table: for standing practice in the classroom with muscle strengthening, body alignment and balance as the objectives.

over the lower right quadrant. The motion of the opposite arm and leg occurring automatically with each step, promotes proper distribution of body weight when walking. He can also be taught to walk backwards, which will help him strengthen hip extensors and give him confidence. Reciprocation must be trained by constant repetition in the effort to speed up walking. A normal rate of motion should be the objective.

Improper use of walkers and pushers may develop incorrect balance attitudes. The proper use of a walker is to aid in balancing, while the child continues to exercise and exploit his walking pattern. Improper use is to allow the child to support himself, lie on the walker, lean forward on his hands, or pull backward for balance. The seat of a chair at the approximate height of the child's hands may be used as a pusher. In walking with a pusher he first takes a step, balances on the advanced foot, pushes the chair, steps with the opposite foot, shifts his weight to the advanced foot, pushes the chair forward. Parallel bars *(Fig. 4)* give a means of securing balance and walking reciprocation, but are not to support the child. The grip of the child's hands on a sliding cuff instead of the rail itself prevents him from clinging to the bar to maintain posture. It is necessary that he acquires some push with his feet and a shifting of weight forward, rather than propulsion by the tendency to pull himself forward.

Even when balance is poor, if a child can support his weight on his legs and has fair control of his arms, he can usually be taught walking by the use of walking accessories. When standing balance can be maintained for a few minutes and reciprocation is fair, we turn to crutches, canes and independent walking. Crutches may furnish a diminishing amount of assistance as balance is acquired by him, and should be discarded gradually for less support, as the child tends to depend upon them if allowed to continue their use indefinitely. From regular crutches to Canadian, half-crutch, weighted canes, standard canes, one cane, and then to independent walking is one progression series. Sawhorse or crab crutches may be used according to the need. As a progression from parallel bars these crutches, used reciprocally, demand greater balance efforts. Walking up a slight incline, taking steps backward and sidewise with and without accessories increase muscle control and, through the slightly different problems presented, aid in more firmly establishing balance. It can readily be seen that assorted apparatus and braces are valuable aids to treatment in assisting the child to carry out the specific motion in which he is being trained. Standing *(Fig. 5)* practice in the classroom may be obtained through the use of an ad-

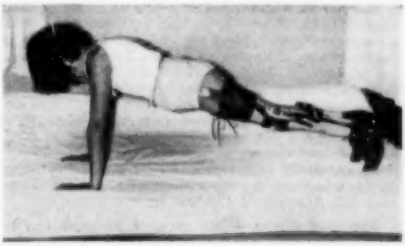

Fig. 6. Push-up Exercise: for muscle strength and control, and body alignment.

justable table with a back support. Push-ups from the mat as an exercise should not be overlooked. This exercise *(Fig. 6)* strengthens muscles, gains muscle, neck, and trunk control, gives practice in body alignment.

Functional activities to be practiced are many. They may include ramps, curbs, steps of various sizes; the use of chair and stools of different heights in sitting down and rising; elementary falling technics; locking and unlocking braces; getting down to and up from the floor; picking up articles of various sizes from the floor; opening and closing doors; stepping on and over objects; chinning; climbing stall bars; stopping quickly. Of importance in these activities, as well as in plinth and standing work, is the observance of correct body alignment.

Dr. Arnold Gesell has reminded us that we should consider the whole child in our interpretive guidance. Although our work as physical therapists is primarily that of treating the motor behavior, we should emphasize also adaptive behavior or resourcefulness in adjusting to new situations; language behavior or vocalizations; and personal-social behavior, or habits of self-help.

BIBLIOGRAPHY

1. Steindler, Arthur, *The Mechanics of Normal and Pathological Locomotion in Man*. Baltimore, Maryland: Charles Thomas, 1935. pg. 13.
2. Deaver, George G., and Mary Eleanor Brown, *Physical Demands of Daily Life; an Objective Scale for Rating the Orthopedically Exceptional*. New York: Institute for the Crippled and Disabled, 1945. 36 pp.
3. Gesell, Arnold, "Developmental Diagnosis and Guidance," *The Physical Therapy Review*, 28:128-129, May-June, 1948.
4. Hastings, Rebecca B., "Bracing for Cerebral Palsy," *The Physical Therapy Review*, 28:112-117, May-June, 1948.
5. Hutchinson, Esther, and Elizabeth Lanctot, *Handbook on Physical Therapy for Cerebral Palsy*, Columbus, Ohio: Ohio Society for Crippled Children, Inc., 1950. 47 pp.
6. Jacobs, Julian E., "Cerebral Palsy," *The Physiotherapy Review*, 27:172-173, May-June, 1947.
7. Phelps, Winthrop M., "Let's Define Cerebral Palsy," *The Crippled Child*, 26:4-6, 28, June, 1948.
8. Pohl, John F., *Cerebral Palsy*. Saint Paul, Minnesota: Bruce Publishing Company, 1950. 213 pp.
9. Saint James, Robertine, "Methods of Treatment for the Cerebral Palsied," *The Physiotherapy Review*, 27:166-171, May-June, 1947.
10. Saint James, Robertine, "Treatment of Cerebral Palsy," *The Physical Therapy Review*, 28:102-106, May-June, 1948.
11. Schlesinger, E. B., "Pharmacological Agents in the Treatment of Neuromuscular Disorders," *The Physical Therapy Review*, 28:100-101, May-June, 1948.
12. Sheldon, Marjorie F., *Testing Functional Ability in the Orthopedically Handicapped*. New Jersey: Newark, Branch Brook School for Crippled and Cardiac Children.
13. *Help at Last for Cerebral Palsy*. New York: Public Affairs Committee, Public Affairs Pamphlet, No. 158, 1950. 30 pp.

Meet Our New Contributors

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She is a member of the American Physical Therapy

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Specialized Neuromuscular Technics in the Treatment of Cerebral Palsy

Margaret Knott, B.S.

The Kabat-Kaiser Institute has treated 442 patients with diagnoses of cerebral palsy in the past five and a half years. These cases included all types of cerebral palsy with severe involvement in many. The age range was from six months to 45 years, with the response to treatment similar except in patients with marked contractures. The improvement in nearly all of these patients was slow but marked. The treatment program occupied the full day, consisting of intensive muscle training one to two hours daily, with additional treatment in the gymnasium, mat exercises, gait and self-care training, and occupational therapy. This paper will be limited to a consideration of only the muscle training phase of the program. This phase has been developemental over a period of years and presents the specialized neuromuscular technics we use in the treatment of cerebral palsy.

In the muscle training program, mass movement patterns against resistance were emphasized. Some of these patterns were total flexion movements which brought in flexion of the neck with flexion of both lower extremities; mass extension in which neck extensors and extensors of the upper back contracted simultaneously with extension of both lower extremities; and, thrust patterns of the lower extremity emphasizing extensors and abductors of the hip with plantar flexors of the ankle. Patients improved noticeably with such motions when maximum resistance was applied. Examples of other reinforcement technics included use of flexors of the elbow to reinforce the wrist extensors, hip and knee flexion to reinforce dorsiflexors of the ankle, and wrist extension to reinforce the long abductor of the thumb. The above reinforcements were best carried out by giving maximum resistance to the larger groups of muscles without letting motion occur, and thus limiting motion to the distal muscle groups. In addition to the mass patterns and reinforcements, stretch reflex was utilized in application of muscle training. For example, a common way of getting a contraction of the hamstring muscles was to put the patient in a sitting position, sometimes leaning forward, before attempting resistance to knee flexion.

A careful analysis of the above technics over a long period of time revealed synergistic motions always occurring together. These motions were found not only to be synergistic in behavior but they were observed to be diagonal in direction. It was noticed when normals attempt to get power and endurance in motions that they also carry them out in diagonal patterns. For instance, a man using an axe to cut a tree would not depend on straight flexion of the upper trunk and straight motions of the upper extremity for power and accomplishment, but he would utilize rotation of the trunk and the arms to best carry out his chore. All sports activities demonstrate such directions of patterns for greatest skill and coordination. Close observation of functional activities revealed complex synergistic motions (patterns) rather than straight motions.

Immediately after starting to use diagonal directions in the mass movement patterns, it was found that rotation was an essential factor in big motions of the trunk as well as in both upper and lower extremities. An excellent example in the upper extremity is the attempted motion of a tennis serve. Here power and coordination are desired, and rotation is readily apparent. Mass movement patterns as utilized therapeutically in our program are based essentially on detailed analyses of such motions.

The patterns described above with maximal resistance added success to muscle training of cerebral palsy patients. In athetosis, it was found that patterns were difficult for the patient to carry out. In attempting the prescribed pattern a patient with athetosis would do a part of the pattern, but in a very distorted, piecemeal way. In order to perform a pattern of flexion and adduction of the shoulder as used in feeding, the two motions would be done

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separately, usually with adduction preceding. For such patients emphasis was placed on teaching the patterns by applying maximal or submaximal resistance, and guiding the extremity into the preferred motions. Often emphasis was placed first on breaking up the pattern into straight motions which the patient could perform more easily; then superimposing the more difficult patterns upon these as soon as the patient could be guided successfully. Favorable results in teaching patterns are based on proper application of timing, proprioception, starting position and range of motion.

In applying maximum resistance, it should always be remembered that motion throughout the range should be slow, barely allowing the patient to move through the range. Muscle power will vary in the components of the pattern, as well as in different phases of the range; therefore, the resistance must fluctuate accordingly. By this type of resistance, the greatest number of motor units are activated, and the desired neuromuscular mechanism is stimulated to maximal activation.

PROPRIOCEPTION

Proprioceptor stimulation is essential in obtaining best results. In giving resistance to an extremity, the patient responds better if the physical therapist applies counter-pressure to the surface toward which the motion is desired; for example, on the dorsum of the hand for extensors of the fingers and wrist. The counter-pressure should stimulate the deep proprioceptors without causing pain. So many patients do not put forth maximal effort because the pressure of the resistance is divided between the agonist and antagonist directions. Thus, in flexion of the elbow the pressure should be applied to the flexor side of the forearm instead of a grip in which the fingertips press into the extensor surface. Applying traction to an extremity while giving resistance adds control and power to the motion. The traction given should be maintained throughout the range for best results. Another important factor is the stretch stimulus which is given slowly and graded to maximal to avoid reflex actions. Pressure, traction, and stretch are accepted forms of proprioceptor stimulation.

The most vital and important part of proprioceptor stimulation is related to the timing with which resistance is given to the components of a pattern. By timing, it is meant that the various components of a pattern respond in a sequence. The sequence is initiated by resistance to the strongest component first. Once the strongest motion has started, all other synergistic motions contract simultaneously. While the patient maintains the contraction of the strongest component throughout, the physical therapist guides the part into the motions which are difficult to obtain. All of this should be done slowly so that the patient can contract each part maximally. Often the patient and/or the physical therapist are unsuccessful in following a pattern. Timing may solve this problem. Even with reinforcements, timing plays a big part in the success of its application. The use of arm patterns with leg patterns in mass movements emphasizes this. Usually, in using such mass patterns, one or the other of the extremities is stronger; resistance to the stronger is given and maintained, followed in seconds by resistance to the weaker. In patients with marked weakness, big patterns involving arm and leg, trunk and arms, and neck and trunk are advisible. Timing is easily demonstrated in the use of neck flexors and neck rotators to activate a contraction of the abdominal muscles. The patient attempts to flex and rotate his neck against resistance. Once this motion is accomplished, the physical therapist equals the resistance of the first two motions and immediately shifts the pivot point to trunk flexors. By following the above procedure, abdominal muscles are stimulated. If resistance is applied rapidly to both muscle groups at the same time, very little activation occurs in the abdominal group.

Mass movement patterns with all the above procedures was the basic foundation for the treatment program. In addition, many reinforcement technics were incorporated.

1. Repeated contractions.

This technic is used to build power and endurance usually in single directions. A voluntary contraction is attempted in whatever range is possible, followed by an isometric contraction against resistance. The resistance for this contraction is started submaximally and increased maximally. Without relaxation, an isotonic contraction is required and repeated a number of times, each time against maximum resistance. There are many advantages of such a technic where is is possible to utilize the most favorable part of the range. For example, cerebral palsied patients may be quite strong if resistance is applied to the isometric contraction. Often, however, it is difficult for them to voluntarily perform the motion throughout the entire range, freely or against resistance. In athetosis, the strongest part of the range is in the shortened position. In this event, the isometric contraction is overpowered slightly to allow for repeated isotonic contractions. If the patient has difficulty assuming the starting position, the physical therapist carries the part to the desired phase

of the range to initiate the movement. Wrist extensors in the athetoids are an example of this problem.

2. Slow reversal.

Another technic found valuable in treatment of all neuromuscular disabilities is known as slow reversal. This is based on isotonic contractions against maximum resistance. First obtain a maximum isotonic contraction of the stronger of the two antagonists. Without relaxation, reverse to a maximum isotonic contraction of the agonist. These reversals may be repeated several times, and in short ranges or longer ranges of motion, depending on the fatigue factor. The last motion contracted should be the weaker motion. The slow reversal technic will increase power in both motions. This effect can be noticed during the exercise or immediately thereafter. Emphasis is generally placed on the weaker of the two motions for correction of muscle imbalances. If the imbalance is too great, resistance in a single direction as described previously would be advisable.

A modified slow reversal technic is one in which the isotonic contractions are followed by an isometric contraction at the end of each range. For the greatest success, resistance to the isometric contraction is graded going from submaximal to maximal equaling the patient's resistance. The change from agonistic to antagonistic motions is also done without relaxation. The same results should be obtained as in the preceding technic, but the types of patients who can carry out the different technics would have to be evaluated. Many patients can easily perform isotonic contractions, but find it difficult to do an isometric contraction successfully. This is evident in patients with cerebellar disturbance. Unless a patient adequately accomplishes the desired types of contractions, results were not gained.

3. Rhythmic stabilization.

One of the most effective technics is known as rhythmic stabilization, which is based on isometric contractions. This form of reinforcement is effectively produced by having the patient attempt to hold a joint rigid while the physical therapist applies resistance, alternating from one antagonist to the other. Resistance on each alternation has to be built up from submaximal to maximal according to the potential of the motion. This is done very slowly so that the patient has time to build up to a maximal contraction each time resistance is applied. The alternation of the contraction from agonist to antagonist is done until it is felt that there has been a definite increase in strength in both muscle groups. When this increase has been obtained, the patient then carries out an isotonic contraction through the remaining degrees of the desired pattern. This procedure is more effective if the resistance is applied first to the stronger of the two antagonists and in the most favorable part of the range. It has been found that most patients, except those having cerebellar involvement can readily accomplish this technic.

All of the reinforcement technics described above have proved to be valuable in the treatment of specific types of cerebral palsy. Repeated contractions seemed essential in early phases of treatment of spastics, ataxics, and athetoids. Mass movement patterns were more easily taught with this technic. Muscle imbalance could also be corrected since the procedure stresses motion in a single direction. Slow reversal technic follows the above in ataxics and athetoids. This method was started when the patient could adequately perform all components of the pattern. Ataxics and athetoids find it almost impossible to successfully perform rhythmic stabilization. Spastics improve in power, coordination, and relaxation with this procedure.

SUMMARY

In treatment of patients with cerebral palsy at the Kabat-Kaiser Institutes, the following technics have been developed and successfully used:

1. Mass movement patterns in which synergistic actions are stressed. These patterns are uniformly diagonal and dominantly influenced by rotation. These patterns are fundamentally successful in the treatment of all types of cerebral palsy. In athetosis, these patterns require diligent training, but are essential for functional improvement.
2. Mass movement patterns are closely integrated with other factors: timing, proprioception, and resistance.
3. Mass movement patterns are further reinforced by repeated contraction, slow reversal, and rhythmic stabilization technics. These technics are prescribed for specific problems in the treatment of cerebral palsy as well as other neuromuscular disorders.

BIBLIOGRAPHY

1. Kabat, H.: Studies on Neuromuscular Dysfunction. XII: Rhythmic Stabilization: A New and More Effective Technique for Treatment of Paralysis Through a Cerebellar Mechanism. Permanente Foundation Medical Bulletin. Vol. 8. No. 1. January. 1950.
2. Kabat, H.: Studies on Neuromuscular Dysfunction. XI: New Principles of Neuromuscular Reeducation. Permanente Foundation Medical Bulletin. Vol. 5. No. 3. November. 1947.

Occupational Therapy in the Treatment of the Cerebral Palsied

Margaret S. Rood, M.A., O.T.R., P.T.

Occupational therapy is any activity, physical or mental, administered as treatment by the therapist, on prescription of a physician. In the field of cerebral palsy, it is concerned primarily with the normal mechanics of living such as training for feeding, dressing, and writing. Play also is an important tool in the well rounded development of any child. Early prevocational exploration and training are not sufficiently emphasized by the occupational therapist at this time.

Treatment principles based on diagnosis are utilized in the technics for feeding, writing training, and the like. Some understanding of symptomatology, and what will affect it, is necessary in order to apply the most effective treatment procedures under medical guidance. Too often a technic is applied by rote.

CLASSIFICATION

Gross appraisal of the motor dysfunctions of cerebral palsy allows the classifications of muscle tone or movement disturbance or a combination of the two. Tone may be excessive (+, ++, +++ hypertonus) or less than normal (+, ++, +++ hypotonus). In other words, the "zero cerebral" or "aspastic spastic" would be the most severe, or +++ hypotonus of the distal part of the extremities with, however, certain reflexes present (Babinski). Atony or complete lack of tone is the product of a lower motor lesion such as a peripheral nerve injury. The term should not be used to describe any of the various manifestations of decreased tone in cerebral palsy. The paretic spastic would be classified in the hypotonic group. Excessive hypertonus, whether of the typical spastic flexor or the less frequent opisthotonic extensor type would be +++ hypertonus. In physiological terminology, the latter would be classified as decerebrate while the +++ antigravity hypertonus is decorticate. Antigravity tone refers primarily to the flexors of the upper extremity and the extensors of the lower extremity which resist the effects of gravity when the individual is in the upright position. The masseter is also an antigravity muscle.

It has not been possible to establish an acceptable classification, to indicate when cocontraction, in which agonist and antagonist act simultaneously (true rigidity), is present. Rigidity thus may be used to describe both the true rigidity type and the extensor tonus spastic type.

Hyperkinesia of tremors or nontension athetosis may be classified by the amount of motion. Rest tremors need indication since intention tremors and athetosis increase with voluntary use.

Ataxia and tension athetosis are a combination of tone and kinesia disturbance. Ataxia is hypotonic, while tension athetosis has extensor tone with hyperkinesia.

DEVELOPMENTAL REFLEXES

In treatment of these disabilities there are certain aids based on neurological phenomena with which the therapist should be familiar. If one will but recapitulate the development of the baby in relation to tone and coordinated movement, it should assist the therapist in planning the proper sequence of training and in understanding the basic part reflexes play in development. The very young baby lacks extensor tone; the sucking reflex, grasp reflex, Babinski sign are present. In fact, total withdrawal or flexor reflex occur in response to painful stimuli or sudden loud sound. There is a stereotyped response. Is this not true of the flexor spastic where higher inhibitory (control) centers or part of the suppressor circuit have been incapacitated, allowing the uninhibited reflex patterns, which are only part of the final complex motor development, to act? As the normal baby develops, extensor tone increases, steppage pattern occurs; reciprocal motion and quadripedal progress is usually made before upright walking is attained.

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When he finally succeeds in grasping his toe, is it not the opposite foot the baby grasps? The learning process through motoceptor, tactile, and visual stimuli is obvious in the development of control of the extremities. Early primitive hand grasp with pronation of the forearm gives way to finer coordination. The neck muscles and extrinsic muscles of the eye are proprioceptors. Labyrinthine control is based on static and acceleratory stimuli, and allows for modification of tone on a very simple level. Any neurology text will give the following reflexes which aid in increasing or modifying tone:

Stretch Reflex

Description: Passive stretch of a muscle sends an impulse through the sensory half of the simple reflex arc and back from the spinal cord through the motor efferent to contract the same muscle which was stretched. This is most obvious in the antigravity muscles. It occurs in the beginning of the arc of movement, activated by a quick stretch.

Application: For the spastic muscle give resistance in the direction of the contraction of the muscle. This prevents quick movement, allows maximum inhibition through reciprocal innervation, since gross contraction of the weaker opponent and its allies is represented as a different movement pattern from the prime mover and its antagonist pattern. In writing training a weight over the edge of the table attached by cord to cuff on forearm, and passing over pulley clamped to table on opposite of dominant hand, would give resistance to extension of the elbow. Cuffs above and below a joint with rubber resistance attached between them on the flexor surface would serve the same purpose, as would a wide strip of dental dam rubber attached to the cockup splint on the radial side and passing beneath the axilla of the patient to fasten to the chair back.

For a patient with paresis but enough voluntary control to stabilize a joint, Kabat's "quick reversal technic" is effective in stimulating stronger contraction of the muscle. Voluntary control is much greater than reflex contraction, but in this case reflex stimulation is added to what voluntary excitation is occurring. Because the joint is being held as immobile as possible against the antagonistic "quick reversal" by the therapist, there is a passive pull on a taut muscle or stretch reflex. The stretch reflex is activated only briefly on change of direction, and therefore antagonistic movement against resistance by the patient must be repetitive. This is an effectual physical therapy technic, but not applicable to any occupational therapy activity as yet devised.

Extensor Thrust

Description: Krieg says if the plantar surface of the foot is pressed against a surface, a phasic reaction in all extensor muscles of the limb occurs from activation of stretch receptors in the flexors of the toes. This results in active pressure against the surface.

Kabat uses the terminology "extensor thrust" in a technic described for very weak extension of the fingers. It is a forceful extension pattern for the whole extremity. It is done also against resistance of the "resistance glove."

Application: Since pressure on the sole of the foot increases postural extension tone, it is a building block toward standing; therefore, stimulation of this reflex is important. There should be allotted time for standing activities whether in the "stander-upper," in the standing table, at the sand table with or without pelvic bands, or in front of the wash basin.

Extreme extensor tone in the lower extremities, however, should not be aggravated further by touching feet to object or floor unless the whole pattern has been broken by secure controls.

Kabat's technic could be utilized by forceful dart, beanbag or ball throw, or planing if thumb is hooked on front grip; for the lower extremities, by the foot power printing press, stand-up treadle saw, or loom adaptation for changing shed by depression directly down to side.

Tonic Neck Reflex

Description: If the face of the patient is turned to the right, the right arm has increased extensor tone, the left arm decreased extensor tone.

If the chin is brought down toward the chest both arms have lessened extensor tone, and the legs have increased extensor tone.

If the head is extended both arms have increased extensor tone and both legs decreased extensor tone.

Note: The T.N.R. is effective only when cortical inhibition is lost; it can, therefore, be used for the spastic and the athetoid.

Application: The T.N.R. is used by many patients as a habit pattern to facilitate or lessen tone. It is very difficult to eliminate later. In occupational therapy use activities which logically call for this position. In feeding training teach the child to keep his chin down since extensor tone in the arms occurs when the head drops back. If he turns his face to the side, extensor tone will be

increased in the arm which should be used for feeding.

In leather lacing or gros point, place the work on a stationary frame a little to one side or the other as desired. A fairly long cord is needed to secure the full extension of the arm.

Labyrinthine Reflexes

Description: Prone lying inhibits extensor tone. This is not effective for combined kinesia and extensor tone.

Supine lying increases extensor tone.

Side lying decreases extensor tone in the upper arm and leg, and increases extensor tone in the lower arm and leg.

Application: These are positions to consider as aids in doing exercises. Change position of the patient or bed to prevent contractures resulting from continuous side lying on one side. Position of the head will need to be noted (T.N.R.) particularly in the prone position.

Von Bechterew's Reflex

Description: For strong extensor tone of the lower extremities, sharp flexion of the big toe with light guidance at the knee will give total withdrawal reflex. The use of this reflex both alone and for reciprocation is well illustrated by Dr. Temple Fay.

Application: At the present time no application has been made to activity. However, for the physical therapist it is a great asset as a treatment step.

ADDITIONAL TECHNICS BASED ON NEUROLOGICAL PRINCIPLES

Mass Diagonal Pattern (Kabat)

Description: Arm movement downward across body, including internal rotation of the shoulder with radial deviation of the wrist and grip position of the hand. Return movement back and up into shoulder abduction and external rotation. The elbow may be flexed or extended.

Leg is flexed, outwardly rotated at hip, flexed at knee, ankle plantar flexed with foot in eversion.

Application: Crosscut saw with dowelling bilateral grip set obliquely as originated at the Kabat-Kaiser Institute, Santa Monica, California.

Punch bag at lower level than normal.

Wedging of clay across body to opposite side of table.

Resistance of loom from breast beam to beater. Beater is held back with hand in position to bring arm across body. Throwing shuttle, pulling shuttle out from shed with long weft thread.

Confusion Exercises (Phelps)

Description: The most common one in use is resistance to hip flexion to bring in the anterior tibial when it cannot act in its prime mover capacity alone. Since the injury in this +++ hypotonus (zero cerebral or aspastic spastic) affects the fine coordinate movement of the distal part of the extremity, use of the gross movement pattern of the premotor area, reenforced by resistance will activate the anterior tibial within the total pattern. In neurological terms it is sometimes called Foix's Reflex.

Application: The illustrated pattern and others can thus be predicted. The lower extremity can be trained more easily than the upper extremity and in some cases the prognosis may well be restricted to gross primitive grasp. A gross activity pattern with good resistance will be necessary in any activity to produce results.

Holding During Arc of Motion (Kabat)

Description: In an arc of motion against resistance, the patient with cerebellar intention tremor and ataxia stops when increased hyperkinesia of terminal tremor appears. Motion begins from that point again with control.

Application: With the patient's cooperation, it can be used for the ataxic in feeding and writing training. This stop and start should be repeated as often as necessary.

Rhythmic Stabilization (Kabat)

Description: The patient attempts to hold a joint rigid while the therapist or doctor applies continuous motion in antagonistic directions successively. This is specifically for the lack of joint stabilization and hypotonus of cerebellar intention tremor and ataxia.

Application: This has already been mentioned as reenforcement for the paretic muscle. There is no application to occupational therapy activities at this time.

The foregoing illustrations are some of the possible suggestions for treatment principles with specific samples of application. The individual therapist working closely with the doctor should be able to utilize these and many more. An exploration of whether differing technics applied to muscles having predominantly red or predominantly pale fibers would result in better treatment should be a subject for special study. Denny-Brown's studies indicate which muscles are the red fibered postural holding muscles, and which are the pale fibered muscles whose primary duty seems to be the quick phasic movement. The vastus

medialis and soleus, one-joint muscles, are red while the rectus femoris and gastrocnemius have more pale fibers. Should we, therefore, arrange our activities to use the adaptation for changing the shed on the loom, with maintenance of full extension of the knee against resistance at the end of the arc? The bicycle jig saw with the resistance is phasic. Block printing using body weight to maintain foot pressure, with the knee fully extended against additional resistance on the anterior surface of the knee, would be more specific for the vastus medialis.

Observation, control groups, and accurate recording will do much to disseminate knowledge and to make treatment more effective. Many seemingly simple equipment and technic details facilitate progress of motor control.

In the occupational therapy plan, feeding training and habit training precede dressing and writing training since that is the normal sequence of learning. A detailed breakdown of feeding, dressing and writing procedures, with all necessary information concerning equipment and technics according to degree and type of disability and steps in training, is important for the therapist. Since this is too long for inclusion here I will present brief comments concerning variations in writing procedures by types of disabilities. Detailed methods of such training with motor disability alone, or in combination with central sensory defects, are given in an unpublished master's thesis by the author based on results of training of ninety-eight patients.

The following is a brief resume of the writing training which the author did for the Cerebral Palsy Round Robin Digest for the American Occupational Therapy Association.

WRITING TRAINING

Reasons for Writing Training

Definite carryover training in a functional activity according to specific involvement; athetoid, ataxic, spastic.

Writing Difficulties

1. Inability to hold pencil.
2. Gross incoordination.
3. Cramped difficult writing due to spasticity of certain muscles or due to effort to control involuntary movement.
4. Extraneous movements in parts of the body other than arms and hand which result in poor writing.
5. Fast uncontrolled writing.
6. Too slow writing.
7. Tremor.
8. Shakiness.
9. Poor writing posture.
10. Awkward hand position in writing.
11. Too large writing.
12. Special Disabilities:

Visual defects	Agraphia
Aphasia	Mirror writing
Apraxia	Strephosymbolia

13. Lack of dominant handedness, speech and writing difficulties.
14. Erratic choppy writing under tension although no obvious involvement of upper extremities.
15. Variations in size and placement of letters and words.

Writing Equipment

Quiet room.
Table adjustable in height with a surface for thumb tacking.
Chair with tilted seat and height adjustments if necessary.
Binders if necessary.
Weight bags for feet and nondominant hand.
Phonograph with sedative and rhythmical records.
Metronome.
Paper: 18" x 24" pad newsprint paper
Newspaper sheets
Wallpaper books
Wrapping paper
School pads of ruled writing paper.
Hexagonal crayon.

Phonograph Records for writing training
Quiet records.
Rhythmical records
Fast tempo waltzes for ataxic; slow for athetoid.

Brief Resume of Writing Training

Writing training is not attempted until feeding training is progressing satisfactorily. All problems are undertaken according to their relative importance to the child.

Since individuals and their involvement vary ad infinitum, it is the therapist's understanding and ingenuity which will determine the approach and effective results with each child. In the mixed involvements one or the other type is usually predominant in varying degrees. With as complete understanding as possible of the involvement (including speech and writing centers) the therapist is prepared to attack the writing training problem in the most effective way.

General Considerations:

Dominance: The least involved or the hand most easily used may be selected for intensive unilateral training such as feeding and writing. Sometimes determination of dominance is difficult. "Eyedness," "handedness," "footedness" are frequently alike but physical involvement will interfere with natural dominance. If mirror writing or stuttering occur, change in dominance training may eliminate it.

Check of Cases: Be sure to check the paraplegic for writing difficulties. His writing may exhibit slowness, shakiness, mirror writing, lack of dominant "handedness" with resultant speech difficulties.

Writing Progression: Training is done in a definite progression as is feeding training, from relaxation, control without equipment and paper, finger painting, through to the more difficult steps of dowelling, use of crayon, special grips, spongex on pencil, pencil with rubber pen grip, ordinary pencil, pen and ink; no paper, lines eight inches apart on paper thumbtacked down, through to ruled school paper, and unruled letter paper.

Special Writing Problems: Because of the location of the lesions in many cerebral palsy cases there will be some writing disabilities which cannot be improved or improved so little that training is not worth while. Before doing any writing training, read extensively from psychology and neurology texts on aphasia, agraphia, apraxia, strephosymbolia. Writing training should not be done by anyone not familiar with these conditions.

Mirror Writing: This term is used by the author as a blanket designation to cover specific difficulties in writing including writing backwards, backwards and upside down, upside down. Some unclassifiable departures from the normal.

Children learning to print have difficulty in remembering how some letters are formed, N, S and the like. You, yourself, no doubt have paused to think of the direction of the diagonal in N. A little training in recognition eliminates this difficulty.

For the reversals which are more severe, rhythmical writing training is instituted. The kinesthetic sense of forward movement is instilled by doing strings of letters and finally combining them into words. Teach the child the correct side of the paper from which to start his writing. It will help his reading, also. Printing should be discontinued until forward flowing motion is well established. Agraphia, apraxia, lack of structural visualization require greater experience and patience.

Summary: Writing training is definitely a progressive therapy, the results of which have proved important in the total training of the child regardless of the type of cerebral palsy he may have.

CRAFT ACTIVITIES

Of craft activities, woodwork is one of the best. Basic tools include hammer, plane, saw, screw driver, brace and bit, coping saw, treadle equipment and foot power jig saw. Special adaptations to tools include cross bar handle on screw driver or hammer for primitive grasp, extension upright for front grip of plane, bilateral handle for saw (as developed at Kabat-Kaiser Institute, Santa Monica, California).

For the athetoid: Control resistance bands or weights may be used on the plane in both directions with gradual reduction of resistance. Effort is directed toward reduction of speed. Remember that T.N.R. will increase extensor tone in the arm toward which the patient faces; therefore, unlike the spastic, we may or may not wish to work to the side rather than the more usual planing in front.

For the spastic: Planing is done by the spastic side. Heavy resistance is unnecessary if the bite of the plane is sufficient to give resistance to extension and, therefore, not activate the stretch reflex.

For the paretic type of spastic, use the paretic hand on the back grip of the plane and work across the body in a mass diagonal pattern with resistance provided by the bite of the plane or additional weight or rubber resistance.

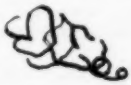
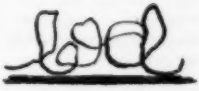
For the ataxic: Planing to the side should be done in time to the metronome for eye-hand coordination. Resistance for building up tone may be added.

PLAY AND MOTIVATION

Group therapy and free play are most important to the growth of children. Cerebral palsied children often lack opportunity to roll and pummel each other on floor or mat; toys are usually selected for them. Be sure to give the opportunity so seriously needed for normal growth.

The occupational therapist should be alert to devising special motivating possibilities to include objectives of other therapies. For example: *Speech:* Words or pictures, which the patient must pro-

Variations of Basic Writing Training

	Flexor Spastic	*Athetoid*	*Ataxic*
Typical Writing Samples			
Characteristics	Stretch reflex of biceps. Spastic elbow flexors, shoulder adductors, & internal rotators cause movement down toward body. Slow.	Pencil jumps from paper. Writing becomes smaller, slanting down to side of paper. Increasing speed of movement. Secondary incoordination.	Irregularity in height of letters due to eye-hand incoordination. Terminal tremor. Primary incoordination in rate, range, direction and force.
Initial Training Movement			
	Arc of movement	"Birds nest"	Over copy or within heavy boundaries. "Birds nests" or series of letters. Metronome for timing.
Resistance	To extensors of elbow in one direction only.	Weight on arm. Resistance direction may vary. Sayre head sling or Thomas collar to stabilize head. Decrease resistance.	As for athetoid. Stop and start technics.
Special Disabilities	Agraphia, aphasia, agnosia are found primarily in spastics along with lack of structural visualization. Astereognosis is found in the paretic type and the +++ hypotonic. Eye movements, also, definitely affect writing. Mirror writing is found in any type where dominance is interfered with by motor disability.		

The above table lists some of the most common variations but the therapist will have to adapt to the individual needs of the patient.

nounce or name, may be worked into a supination game where the top card of a pack is turned up. The first to pronounce the word gets both cards. For the spastic, a strip of dental dam rubber or elastic, attached to the cock-up splint at the palm, is wound once around the forearm and attached to the chairback to give resistance to supination.

The same activity is provided by a light-up box having a row of windows of frosted glass which light up in succession showing letters or pictures as varying degrees of supination are achieved. The graded amount of resistance desired is provided inside the box by easily attached rubber or springs. The crossbar handle for grasp may be built up.

EDUCATION

The aforementioned supination cards with numbers may be used for addition, subtraction or multiplication for the child who has difficulty with vertical movement of the eyes, or who has a simple arithmetic deficiency and needs motivation for practice.

For the ataxic, the arithmetic peg board with places to peg in numbers and signs, serves the dual purpose of providing practice in arithmetic and in eye-hand coordination. Rubber with cuffs or weights and pulley arrangement will provide resistance which must be discarded as coordination improves.

PREVOCATIONAL TRAINING

My final point and one which needs increased attention on the part of the therapist, is prevocational exploration and training for the cerebral palsied. The therapist needs to work in close cooperation with the Bureau of Vocational Rehabilitation, Goodwill Industries, and with sheltered and industrial workshops. Early work training should fall within the scope of the occupational therapist. An early, realistic appraisal in conjunction with the skilled advisement officer as well as the doctor, should result in a special plan based on the resources and possibilities of the community and the patient. Lack of simple work habits and tolerance penalize the cerebral palsied individual who has a flighty, adolescent, wishful approach to employment objectives. Work discipline, specially devised equipment, a breakdown of the job into motion and time study units may prepare the individual for proper placement.

SUMMARY

In summary, there are changing technics in the treatment of the cerebral palsied which utilize reflexes as building blocks and as modifying influences to develop control for coordinated movement. An understanding of neurophysiologic function is essential for knowing which channels are available to assist in building correct patterns. With the wide variety of coordinated activity used for the patient, the occupational therapist must be capable of adapting the method to suit the needs of the individual and his treatment problem.

Treatment should follow the ontogenetic development pattern. The coordinated skills as well as the earlier gross coordination patterns follow the step by step rule of development to more highly complex skills. All aids to training, whether the sponge rubber grip on the pencil, the feeding board or the use of resistance, are temporary crutches and should be modified or discarded as soon as possible. Do not attempt to take too many steps at once. Smaller units of planned progress pay large dividends in regular increase of ability.

The occupational therapist feels that for the cerebral palsied, her energy should be expended on recreation, feeding, habit, dressing and writing training as well as prevocational thought and preparation to meet the physical, social, emotional, and economic needs of the patient in so far as it is possible to do so. Within the confines of this paper it was impossible to adequately cover all treatment modalities used. Writing and woodwork were stressed to suggest some of the treatment principles in action and to indicate problems other than the motor and psychological ones.

No real indication has been given of the close correlation of efforts of the treatment and service team which is necessary for the best results. Neither has an indication been made as to the number of individuals with highly specialized training who must interact under the guidance of the medical profession to provide the best possible habilitation program for the cerebral palsied.

SELECTED BIBLIOGRAPHY

1. American Occupational Therapy Association: *Cerebral Palsy Rourd Robin Digest, 1938 to 1941*. New York: American Occupational Therapy Association (out of print).
2. Carrol, J.: The Utilization of Reenforcement Techniques in the Program for the Hemiplegic, *American Journal of Occupational Therapy*, 4:214, 1950.
3. Connell, K. A.: An Occupational Therapist's Approach to the Vocational Problems of the Cerebral Palsied, *American Journal of Occupational Therapy*, 4:211, 1950.
4. Coordinating Council for Cerebral Palsy: *Cerebral Palsy Bibliography*. Compiled by M. Abbott. New York: Coordinating Council for Cerebral Palsy, 1950.
5. Denny-Brown, D.: On the Nature of Postural Reflexes. *Proceedings of Royal Society*, 104 B, 252-301, 1929.
6. Fay, Temple: The Neurophysical Aspects of Cerebral Palsy. *Archives of Physical Medicine*, 29:(May) 1948.
7. Fulton, J. F.: *Physiology of the Nervous System*, Third Edition Revised, New York: Oxford University Press, 1949.
8. Gesell, A., and Armstrude, C. S.: *Developmental Diagnosis*, Second Edition Revised, New York: Paul B. Hoeber, Inc., 1946.
9. Herta, E., and Putnam, T. S.: *Motor Disorders in Nervous Diseases*, New York: King's Crown Press, 1946.
10. Kabat, H.: Studies on Neuromuscular Dysfunction, XI: New Principles of Neuromuscular Reeducation, *Permanente Foundation Medical Bulletin*, 5:(March) 1947.
11. Kabat, H.: XII: Rhythmic Stabilization, A New and More Effective Technique for Treatment of Paralysis Through a Cerebellar Mechanism, *Permanente Foundation Medical Bulletin*, 8:(January) 8-19, 1950.
12. Kabat, H.: XIII: New Concepts and Techniques of Neuromuscular Reeducation for Paralysis, *Permanente Foundation Medical Bulletin*, 8:(July)121-143, 1950.
13. Krieg, W. E. J.: *Functional Neuroanatomy*, First Edition, Philadelphia, The Blakiston Company, 1942.
14. National Society for Crippled Children and Adults, Inc. *Cerebral Palsy Equipment*.
15. Neuman, M. K., Rodlow, S., Jewett, H. B.: Multiple Sclerosis, *American Journal of Occupational Therapy*, 4:205, 1950.
16. Nielson, J. M.: *Clinical Neurology*, Third Edition Revised, New York: Paul B. Hoeber, Inc., 1951.
17. Phelps, W. K.: Description and Differentiation of Types of Cerebral Palsy, *The Nervous Child*, 8:2:107-127, April 1949.
18. Reed, Margaret S.: *Writing Training as a Treatment Procedure for the Cerebral Palsied*, Unpublished Master's Thesis, Division of Physical Therapy, Stanford University, January 1949.

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A list of schools approved by the Council on Medical Education and Hospitals of the American Medical Association.

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Outlines the professional course of study for college students preparing for physical therapy. Of value to the high school student who is planning a college program.

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A brief analysis of the various types of employment opportunities open to the graduate physical therapist.

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(Continued on page 93)

Editorials

INTEREST on the part of physical therapists, and awareness of the treatment problems of cerebral palsy are steadily increasing. There must be still greater interest before one of the largest segments of the crippled children's population can have the benefit of the treatment it needs.

The physical therapist, by virtue of his training, possesses certain skills and knowledge required in the total rehabilitation process of the cerebral palsy patient, whose disability is chiefly characterized by motor disorders. If the cerebral palsy patient is to have any degree of self-sufficiency, the physical therapist must assume his part of the responsibility for the treatment.

The concept that there is no substitute for supervised experience in a general department, before a therapist undertakes a special field, is a sound one. Supervised experience for a period immediately following graduation is extremely valuable to those interested in cerebral palsy. Such general experience cuts across almost all of the problems encountered in the rehabilitation of the cerebral palsy patient.

Frequently, new graduates feel reluctant to approach the treatment problems in cerebral palsy because of the emphasis that has been placed on specialization. Upon graduation, a physical therapist has certain basic knowledge in theory and practice which he applies to a patient with poliomyelitis, arthritis, or a traumatic injury. This same basic knowledge has its application in cerebral palsy.

Most new graduates today have had the benefit of more complete and better clinical facilities in cerebral palsy during student training than those who graduated a few years ago. They also have the benefit of research on cerebral palsy in the medical field, in physical therapy, and in other closely related therapies. Consequently, their knowledge of the treatment problems and how to cope with them is more extensive and, therefore, their need for special training is less.

Problems of parent education, an integral part of cerebral palsy work, and treatment technics, functional or definitive, can be approached with more security and adeptness after a year of supervised experience which has included cerebral palsy. Then comes the time to acquire broader knowledge and to work out a refinement of technic in the entity of cerebral palsy, if one has discovered his interests and abilities are there.

Fortunately, the impression that the diagnosis of cerebral palsy embraces a group of hopeless, uninteresting children who show minimal progress, has been dispelled. It is sometimes true that progress is not dramatic and that some children are so severely involved physically and/or mentally that results of treatment are minimal. However, a therapist who has had the experience of treating educable cerebral palsy children will be quick to refute any suggestion that it is hopeless or uninteresting.

Russell Miller, known to millions as the Easter Seal child of 1950, has a history of severe motor disability. Russell has received intensive physical therapy at a nursery school for cerebral palsy children. At the age of seven he entered a regular public school. He is a charming child taking his rightful place with normal children of his own age. Hopeless? Russell's history, typical of some of the nation's nearly 200,000 cerebral palsy children, speaks for itself.

—LOUISE A. BAILEY
Physical Therapy Consultant
National Society for Crippled
Children and Adults

World Confederation for Physical Therapy

Greetings from a Returned Pilgrim!

The M.S. Stockholm of the Swedish-American Line, affectionately dubbed "Noah's Ark" by some delegates on board, carried its professional cargo safely around the tip of Scotland into the lovely North Sea. Early in the morning of Sept. 2nd we passed into Skagerrack and saw the distant shore of Sweden. By nine o'clock we passed Old Elsinore, Hamlet's Castle, and by mid afternoon we were swarming out onto the dock at Copenhagen. Flags of all nations were flying, though slightly dampened by rain, and cheering crowds welcomed old and new comers to Denmark.

There is always some regret on leaving friends after a pleasant voyage, but we were to meet again soon. There was a scramble through customs and out to taxis. Miss McMillan, of Boston, and I rumbled over cobbled streets fumbling for our fare in newly acquired kronors and ores; she on her way to Hotel Vastasohus and I to the Fredriksbberg.

Imagine my pleasant surprise on answering the telephone, less than an hour after reaching my hotel, to hear Genevieve Reilly's voice in welcome. She had come in from Germany ahead of me and wanted me to know about the reception to be given that evening by Mr. Basil O'Connor for all the delegates. Also she said that Blanche Talmud of New York was staying at my hotel and would we plan to go together? My British friend and roommate had not yet arrived.

The reception was a delightful experience. Amidst a sea of strange faces and literally a Babel of voices, one would suddenly find a friend or respond to the smile and handshake from a stranger who didn't speak the same language but shared the enthusiasm.

Seating space was limited for the formal opening of the Polio Conference, so my British friend, who is also a physical therapist, and I registered; then we wandered about the city, dodging the myriads of bicycles that surge through traffic, discovering quaint streets, and beautiful old houses about which we had read.

Later we attended the sessions where all papers on Polio were given in English. Four interpreters, English, Spanish, French, and German were provided, and the audience wore radio translators in readiness for discussions as necessary.

Everywhere in the corridors and in the lunch room of the Anatomisk-Institut, where the Polio Conference was held, and at the Odd Fellows Hall, where the Commercial Exhibits were displayed, the speeches and demonstrations on Polio care were relayed by television sets, which of course carried out into the city and beyond.

At times, the presence of news cameras and television were obviously annoying to the speakers. It was strange to find a camera in the amphitheatre taking a picture of the television camera taking a picture; a sort of wheel within a wheel.

Of the many invitations for visits I chose to go to the Orthopedic Hospital to see exercises for scoliosis. It is a beautiful, modern building with a large, well-equipped gymnasium. First, a boy with post-polio scoliosis was given private instruction. Then followed a class of six girls from about 7 to 14 years. They were given the same exercises which were fundamentally Klapp's Creeping elaborated with arm, leg and trunk work for stretching and flexibility, ending with group ball games. They had an ingenious type of head suspension; a trapeze bar shaped to fit the occiput. The children can lift themselves into this by grasping the ropes and thus take their suspension while waiting their turn at something else. All the floor work was done in unison, each child knowing the correction she needed. I was particularly impressed with the quiet, pleasant voice and deliberate commands of the teacher and with the resulting orderliness and concentration of the class.

There was a delightful drive for a few of us. Mrs. Sigrid Coleridge of Göteberg, Sweden, and Miss Siw Johansson of Malmö, Sweden, had brought their cars and took Miss McMillan of Boston, Miss Elson, our national director, Miss Neilson, Secretary of the Chartered Society for Physiotherapy of London, Miss McAllister of London, Miss Marian Williams of Stanford University, Miss Cooke, my British friend, and me out over the lovely, wide, highway from Copenhagen along the shore. First we passed lovely suburban homes and gardens, then through country villages, some with thatched-roof buildings, and by farms where crops were being harvested. About 25 miles out we stopped for tea at Koller's Gaard where we sat on the porch and looked across the lawn and garden to the open sea. From there we turned west over winding country roads to see, through the gates of Fredensborg Castle, the summer residence of the Royal Family.

I confess that the deep import of my visit in Copenhagen was to be present at the organization of the World Confederation for Physical Therapy.

Only those of us who have watched the develop-

ment of our profession can, perhaps, fully realize that this was a truly historical occasion. Physical therapy is of international importance and should receive our support in every possible way. We must continue to pave the way for reciprocal interests and advantages.

Deeply significant of such possibilities was the fact that a group of people representing 15 nations could be drawn together, not only by a professional bond, but in real friendship.

At the inspiring dinner party which closed the meeting of the new Confederation, toasts of congratulation and of loyalty were given, and hands were clasped in one unbroken line, as we stood around the beautifully decorated tables and sang "Auld Lang Syne."

As fellow members, I urge you to read in the *Review* the reports of what the Association has done and will continue to do for the World Confederation for Physical Therapy of which we are all a part, and remember that it requires each one of us if we are to be united in a world organization.

EDITH MONRO
Member of the New Jersey Chapter
American Physical Therapy Association

To the Editor:

When I received your request for some of our impressions of the conferences and our European tour, I dared not begin for fear of going on indefinitely. Even so, I have tried to jot down a few things that were outstanding in my memory of my two months abroad this summer.

After hearing Dr. Harold Balme, Joint Consultant to the United Nations, and Mr. Leonard Mayo, Director of the Association for the Aid of Crippled Children, express the hope that through a combined and common interest in the rehabilitation and treatment of cripples throughout the world, the various nations could find the road to peace, I hoped it might be possible. The reconstruction of railroad stations in Italy and the newly developed bomb shelters in Denmark, remind us of the need for such a hope to guide us away from the tragedies of five years ago, and the ominous outlook of the present world scene. Perhaps these World Congresses will help us to accomplish this and to find peace.

The dinner we had together at Skansen in Stockholm probably gave us one of the best opportunities to shuttle ideas about physical therapy. Just to open the conversation, I happened to mention the use of the paraffin bath in the treatment of osteoarthritic hands and of my success with it. Surprisingly enough a physical therapist from Australia voiced her hearty approval and proceeded to tell of the excellent results she had had. A Swedish therapist sitting nearby had never heard of the treatment, so we explained it to her. (I shall be embarrassed if her results are not good!) Our discussion continued and eventually we reviewed one of the morning seminars. We, from Nebraska, had been astonished at the conservative treatment of lumbago and sciatica demonstrated to us by the Swedish hospital staff. I expressed that astonishment. Their method in sequence was: 1) to relieve pain by immobility and rest of the dorsolumbar area by casting; 2) to make the cast into a splint when the pain diminished and to start a graduated series of exercises; 3) within a comparatively short time, to begin highly vigorous exercises and carry them on, depending upon the individual case. We had been dumbfounded at the vigorous bending and lateral twisting exercises these patients performed, a matter of months after their highly acute symptoms of lumbago. When I mentioned the treatment at Skansen, the Australian remarked that they had been using the method for quite some time and that it had been highly successful. I learned something that time!

The contacts that we made did not always mean the exchange of ideas on therapeutic methods and technics. I questioned a British physical therapist on the subject of wages—a topic of concern to every working person. The physical therapists in Britain have a real problem. Their socialized government must offer doctors and physicians such high salaries to induce them to support the socialized program that little is left in the budget for the rest of the medical team. As a result the fight of the therapist for higher wages is a matter of barter in Britain and involves infinite time and courage. We Americans struggle with the flexible line of policy; the British therapists must hurdle a more inflexible and certainly more stringent governmental budget.

Our two weeks experience in the Scandinavian countries gave us the opportunity to meet and enjoy the pleasant company of people foreign to us. I spent a very happy afternoon touring Copenhagen with a young nurse from Jamaica.

The most pleasant and biggest surprise of my trip was to meet, after traveling some 7,000 miles, my old Stanford roommate, Gertrude Ambrose, in the lecture room at Copenhagen—someone I

had not seen or heard from in five years. Can the world grow any smaller than that!

Such a trip is a revelation, and to be recommended for all who enjoy the interchange of ideas with colleagues from all parts of the world.

EMMA JANE WILDER
Member of the Nebraska Chapter
American Physical Therapy Association

Association Activities

Annual Meeting of the Canadian Physiotherapy Association

The Canadian Physiotherapy Association extends an invitation to any members of the American Physical Therapy Association who would care to attend the 1952 annual meeting to be held in Toronto at the Royal York Hotel on Friday and Saturday, April 4th and 5th.

American Registry of Physical Therapists

By invitation of the American Registry of Physical Therapists, the Executive Committee has appointed Margaret Moore, American Physical Therapy Association Educational Consultant, and Elizabeth Wood, Chairman of the Illinois Public Laws Committee to serve for a two year period as members of the Board of Registry.

Code of Ethics Revision

At its semi-annual meeting held in New York, November 29 to December 1, 1951, the Executive Committee appointed the following committee to recommend desirable changes in the Code of Ethics of the American Physical Therapy Association and amendments to the Bylaws:

Mary Nesbitt, Speaker of the House of Delegates
Virginia Greenwood, member of the Public Laws Committee
Mary Haskell, Assistant Executive Director.

All members and chapters who have suggestions for changes in either the Code of Ethics or amendments to the Bylaws are requested to submit such suggestions in writing to the American Physical Therapy Association, 1790 Broadway, New York 19, N. Y., for consideration by the committee.

Chapter News

Carolina Chapter

Upon request of the members of the Carolina Chapter, the Executive Committee approved the dissolution of the chapter to be replaced by the North Carolina Physical Therapy Association, Inc., and the South Carolina Chapter.

Bylaws for the two new chapters have been approved and officers elected, as follows:

North Carolina

President—Edna Blumenthal
Vice-President—Celeste Hayden
Secretary—Mrs. Sally Lowe
Treasurer—Mrs. Mabel Waynick
Director—Maria Kennedy

South Carolina

President—Margaret Graydon
Vice-President—Norvaile Newell
Secretary—Mrs. Winifred Werry
Treasurer—Nelle Fooshe
Director—Emily Cate

Recruitment

It is quite apparent that most chapters are wide awake to the vital need for recruiting more students of physical therapy. Furthermore, it is gratifying to hear that active plans are being inaugurated by many of the chapters. The need for more physical therapists is so acute and the competition so keen, that we can only approach a solution through the active participation of every qualified physical therapist in the country. This means of course every active and inactive member of the American Physical Therapy Association. We would like particularly to appeal to our inactive members to spend as much time and effort as possible in interesting students and following through until all classes in all schools of physical therapy are filled to overflowing.

Chapters are to be asked to appoint separate recruitment chairmen to coordinate all recruiting. Every member will receive a memo and copy of vocational guidance material to use in this campaign.

New 1951 Directory

An alphabetical directory of members of the Association is available to members, through the National Office, at fifty cents a copy.

Conference 1952

Ye Bellevue-Stratford
Philadelphia, Pennsylvania
June 23—28, 1952

The Philadelphia Gazette Vol. 2

Patient Reader: Your humble Writer did lately journey, in the good company of Poor Richard, to the District to the north of Philadelphia once called Germanopolis. This wooded Land, now called by its Inhabitants Germantown, is singularly rich in History and blessed with Natural Beauty. Here did settle those early Men from Crefeld, Germany, to found one of the earliest Communities completely self-governed. At its Birth, the Heads of several families did meet in a Cave along the Delaware then owned by Daniel Pastorius and did draw Lots to settle Ownership of Land. Some of these same Properties are still intact today and owned by Descendants of those early Settlers.

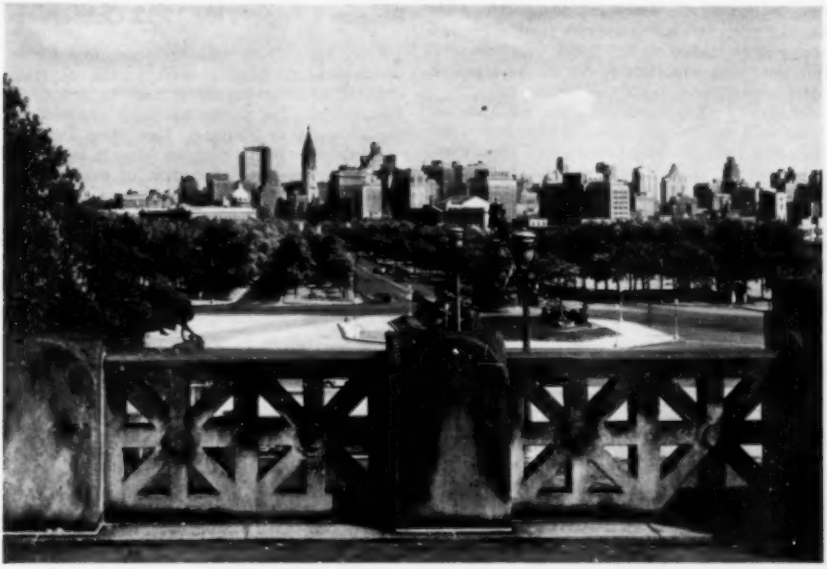
Great Mansions did arise in this fair Section and many still Remain to delight the Eye. One of the Finest still intact is Stenton Mansion, once the Home of James Logan, Friend and Secretary to the Governor Penn. As Poor Richard says, this ofttimes became the Gathering Place of peaceful Indians bent on Conference who camped along the Wingohocking Creek still visible below the House.

Nearby the Gentle Visitor may see the now turbulent Wayne Junction which earlier marked the Site of a Primitive Bridge over which the first Railway did travel from Philadelphia to Germantown. In its early days the open, wooden Coaches were drawn by many Horses until they were replaced by Baldwin's dream, "Old Ironsides," which did come puffing through on fair Days only. This Marvel of Transportation was rumored to make this five mile trip in less than Two Hours! Poor Richard doth agree this was a Veritable Age of Miracles.

Still intact unto this Day within the Area of which we speak are the only two Presidential Mansions (excepting those in Washington) still standing. One of these, now called the Morris House, did offer Refuge to Washington fleeing from the Great Epidemic of 1793 which swept through Philadelphia. The rather unusual Shape of the House is said to be because the Builder "Honest David" Deschler, altered the plan to avoid sacrificing a Plum Tree growing in the yard.

The Center of Germantown, both Socially and for Business, is still the great Market Square. Here we may see the land which once held the Market House, Hay Scales, Stocks, the Jail, and Friendship Firehouse. Market Day was held twice weekly, and Wagons filled with Many Commodities did choke the single Road leading in from the West. This same Thoroughfare enjoyed the dubious distinction of being Known as "the worst

Morris House, Philadelphia, Nation's Capitol 1773.



Benjamin Franklin Parkway, Philadelphia. Courtesy of the Chamber of Commerce.

Road in the United States" since it blew away in Dust when Dry and swallowed Horses and Carriages whole when Wet.

Contained, too, within this Section stands the Town Hall of graceful Lines. From its Tower sounds a Bell whose voice is said to have the Sweetest Tone in all this Land, which fact results from the Adding of a thousand Spanish silver Dollars melted into its Metal. This same Bell once hung and sounded from the Tower of Independence Hall, replacing the Liberty Bell when that one Cracked asunder.

The patient Traveler may notice that very near begins the Wooded sector called the Wissahickon Park replete with Nature's Wonders. Here, or so it is reported, did dwell a Strange Group of Her-

Old Market Square, Germantown, 1830.

Trinity Lutheran Church, 1857. Steeple after design by Christopher Wren.

mits, hiding in the Caves and living from their Surroundings. All are buried now upon a gentling rising Slope, called by all Spook Hill, for it is told how even now their Spirits can be heard on fitful Nights crying with the Storm.

Much more Remains to tell about that Time but Space will not Permit. Your Writer hopes that these few Facts will help to stir your Curiosity and cause you to Seek others of a personal Interest, for History is much alive in Germantown.

Photographs of the Old Market, the Morris House, and Trinity Lutheran Church, were made available through the courtesy of the Germantown Historical Society.

The Society's Museum and Library are housed in the Conyngham-Hacker Home built in 1772.

Conference Program

The 1952 Conference program schedule will follow a pattern similar to that of last year.

The School Section will convene all day Saturday, June 21.

The House of Delegates will be in session beginning Sunday afternoon, June 22, and all day Monday, June 23.

The Pennsylvania Chapter, Inc., will be host at a special social event on Monday afternoon following the adjournment of the House.

This year it is planned to have concurrent scientific sessions in order that there may be wider coverage of subjects, and to meet the needs of more of you. This will include symposiums on geriatrics, pediatrics, industrial accidents; hand injuries, including frostbite, electrotherapy, and neurological conditions; reflex patterns of movement, and research papers.

The general meetings will be held beginning Tuesday morning and will continue through Thursday. On Friday something different is planned as a postconference offering—Instructional Courses. These will be held all day Friday and Saturday morning. For those registered at Conference, the cost will be five dollars, and for those who wish to attend the instructional courses alone, the cost will be ten dollars.

These courses will be open to members only since attendance will be limited. Tentative subjects include reflex patterns of movement, analysis of gaits, electrical investigation, and neuroanatomy.

It is planned to have advance registration for both the general meetings and the instructional courses.

Conference registration fees $5.00 for regular members—$2.00 for student members.

Research Papers for 1952 Conference

Once again there will be opportunity for individuals in the physical therapy field to present original research papers at the Conference in Philadelphia. The section has been scheduled for the afternoon of Thursday, June 26th. This year an attempt is being made to provide more time for presentation and discussion of material, and there may be two concurrent sessions if the quantity and quality of papers submitted warrant this. One page summaries of papers may be sent to the American Physical Therapy Association, 1790 Broadway, New York 19, N. Y., and must be in by March 15th in order to be reviewed by the selection committee.

Meet Our New Contributors

(Continued from page 72)

Association, the American Occupational Therapy Association, the Rehabilitation Association, and the Southern California Mental Hygiene Society.

Harold Westlake—Director of the Speech and Hearing Clinic, and Head of the Department of Speech Correction and Audiology at Northwestern University, Evanston, Illinois, received his A.B. degree from Michigan State Normal College, and his M.A. and Ph.D. from the University of Michigan.

Dr. Westlake taught on the staff of the University of Michigan and at Penn. State College, and was Director of the State Speech and Hearing Program of Pennsylvania.

Dr. Westlake is Counselor to the National Society for Crippled Children and Adults; President, American Speech and Hearing Association; Associate Editor, *Journal for Exceptional Children*, and is a member of the American Academy for Cerebral Palsy.

Marguerite E. Whipple—Physical therapist of the Gorman School, Dayton, Ohio, attended the University of Wisconsin and Ohio Wesleyan University. She was graduated from the latter with a B.A. degree in physical education.

In the summer of 1940 Miss Whipple entered the Harvard University Medical School for physical therapy training. She received her certificate at that institution and her diploma in physical therapy at the Cleveland Clinic. Several years later she returned to college and completed requirements for a Master's degree at Miami University. Following this, she was granted a certificate in Cerebral Palsy work at the Children's Rehabilitation Institute, Cockeysville, Maryland.

Miss Whipple served in the Women's Medical Specialist Corps during World War II. Before accepting her present position, she was Counselor and Director of Girl Scout Camps, and was Supervisor of Physical Education for Girls in high schools in Minnesota and Ohio. She is a member of the American Physical Therapy Association, the American Registry of Physical Therapists, and is a member of the Ohio Education Association.

Membership News

Jean Marie Scott, one of the founders of the Rhode Island Chapter, passed away November 9, 1951 in Providence, Rhode Island.

Miss Scott was a native of Scotland and became a member of the American Physical Therapy Association in 1927. At the time of her death, she was director of the Rhode Island Hospital physical therapy department, which she helped to establish in 1921.

The Cerebral Palsy Clinic at the hospital was of special interest to her in recent years, and a memorial fund is being set up in her name to benefit the clinic.

The death of **Emma E. Schrampf** on December 24, 1951, was a great loss to her friends and colleagues.

Miss Schrampf was associated with the New York Orthopedic Hospital for 35 years as director of the Physical Therapy Department. She had been a member of the American Physical Therapy Association since 1922, and served as second vice-president from 1944 to 1946. She was a charter member of the New York Chapter and worked with unabating enthusiasm to contribute to the profession and the Association throughout the years.

Emma Schrampf was an outstanding personality, her knowledge and understanding combined with a rare gift for teaching have been of untold benefit to her patients and associates alike. Her high ideals and devotion to her work were an inspiration to all who came in contact with her. The memory of her beautiful faith and spirit will live.

—ELLA BIONDI

School News

The Institute of Physical Medicine and Rehabilitation of New York University-Bellevue Medical Center, in conjunction with New York University School of Education, offers a four-week course in physical rehabilitation methods for physical therapists. College credit of four points will be given undergraduate and graduate students upon completion of the course.

For further information write to: Miss Edith Buchwald, Director of Rehabilitation Courses for Physical Therapists, Institute of Physical Medicine, 400 East 34th Street, New York City.

New Student Members

Childrens Hospital Society

Vernon S. Barney
Victor R. Behar
Bernice J. Cleveland
Jean F. Cutler
Carlyn Daughters
Ilanon V. Dycer
Ernece R. Fischer
Ila D. Holmes
Trana Labowe
Shirley McLennan
Charles E. Ruste
Claire W. Sherman
Richard E. Whitlock
Joan S. Zsupnik

Columbia University

Manfred Hecht
Mary E. Hieber

Duke University

William P. Belle
Phyllis E. Carleton
William B. Daugherty
Dorothy J. Deeley
William T. Dozier
Cathryn S. Martin
Charles M. Peterson, Jr.
Jean L. Robinson
Ned M. Ross
Kit Wan Soo
Mary Lou Spring
Francis T. Visconti
Marian L. Wiencke
Priscilla T. Williams

Medical College of Virginia

Jane Bell
Ann H. Goudelock
Martha Lamberson

University of Pennsylvania

Garfield Crawford
Edwin Lavin
Charles Pujals, Jr.
Lumida Rodriguez
Joan F. Sprinkle

University of Southern California

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Betty Burton
Elizabeth M. Coutts
Kenneth E. Gaalaas
Vilas M. Gschwind
Richard B. Holthouse
Catherine Ledford
M. Valletta Prehoda
Helen Puskas
Rosella M. Rubel
Zigmund James Turoski
Helen L. Varelia
Lucille Warren
Stanley L. Wendkos

Marriages

Janet M. Rich of Brooklyn, N. Y., to John Bradley, Houston, Texas.

Gloria A. Peca of Mahonoy City, Pa., to Carter Davison, Boston, Mass.

Margaret Heidbreder of Stillwater, Okla., to Richard Eppright, M.D., Boston, Mass.

Ensign Anna L. Zahniser, NC USNR, of Philadelphia, Pa., to Charles Ganley, Philadelphia, Pa.

Carolyn M. Pfahler of Ann Arbor, Mich., now Mrs. Carolyn P. Haman, Pittsburgh, Pa.

Lois Reiser of Schenectady, N. Y., to Carl O. Hansen, Syracuse, N. Y.

Dorothy Masters of Pasadena, Calif., to Francis Haskins, Pasadena, Calif.

Patricia J. Busselle of Denver, Colo., now Mrs. Patricia B. Keener, Denver, Colo.

Ruth Yeck of Lakewood, Ohio, now Mrs. Ruth Y. Parks, Omaha, Neb.

Marjorie Mueller of St. Joseph, Mich., to Daniel Stamm, St. Joseph, Mich.

M. Carolyn Pope of Rocky Hill, Conn., to Paul E. Thomas, Elmsmere, Del.

COLONEL EMMA E. VOGEL

First Chief of Women's Medical Specialist Corps Retires

Colonel Emma E. Vogel, first Chief of the Women's Medical Specialist Corps, was one of three retiring colonels honored by the Military District of Washington at a retirement ceremony held at Fort Meyer, Virginia, on November 29, 1951.

Colonel Vogel has a long and distinguished record of service with the Army Medical Service. Her Army career began in 1919 when she was appointed a physical therapist at Army General Hospital No. 24, near Pittsburgh, Pa., but she is most widely known for her work at Walter Reed Army Hospital, in Washington, D. C.

After the first world war, Colonel Vogel helped organize the first postwar training course in the country for physical therapists. This course was at Walter Reed Army Hospital and was among the first such courses to receive professional recognition from the American Medical Association.

In 1942, Colonel Vogel was transferred to the Office of The Surgeon General of the Army to effect an organization for physical therapists. In January 1943, she was appointed a major in the Army of the United States, thus becoming the first military head of Army physical therapists.

She was awarded the Legion of Merit for effectively organizing the Physical Therapist Branch and for formulating policies and plans to insure the highest standards for treatment of the sick and wounded. Only four women in the Women's Medical Specialist Corps have received this decoration.

As the first chief of the Women's Medical Specialist Corps, Colonel Vogel headed what was formerly three separate groups in the Army Medical Service—dietitians, physical therapists, and occupational therapists.

She is a charter member of the American Physical Therapy Association and is chairman of the Women's Medical Specialist Corps Section of the Association of Military Surgeons of the United States.

Lauding Colonel Vogel's service, General Armstrong said: "Her championship of the ever wider use of women's professional skills in the Army Medical Service has contributed immeasurably towards the high esteem enjoyed by the Women's Medical Specialist Corps today. She carries with her into private life the heart-felt thanks and best wishes of our entire service."

In reference to Colonel Vogel's retirement, Major General Norman T. Kirk, retired, former Surgeon General of the Army, stated: "The Women's Medical Specialist Corps will miss you and so will the Army Medical Service. No woman, either as a civilian employee of the Medical Department, or a commissioned officer in one of its Corps, has made the contribution to the Medical Department that you have made."

Colonel Vogel will continue to live in Washington, D. C., at 3901 Connecticut Avenue, N.W.

Index to Current Literature

Anterior Poliomyelitis

Medical Care in Poliomyelitis. Kenneth S. Landauer. Journal of the Florida Medical Association, October 1951.

Atmospheric Conditions and the Spread of Poliomyelitis. Charles Armstrong, M.D. American Journal of Public Health, October 1951.

Paralytic Consequences of Poliomyelitis Infection in Different Parts of the World and in Different Population Groups. A. B. Sabin, M.D. American Journal of Public Health, October 1951.

Second Attacks of Paralytic Poliomyelitis in Human Beings in Relation to Immunity, Virus Types and Virulence, with a Report of Two Cases, and Four Other Individuals in Baltimore, 1944, Infected with Virus of the Leon Type. David Bodian, M.D. American Journal of Hygiene, September 1951.

Upper Respiratory Infection as a Factor Influencing Susceptibility to Poliomyelitis. Theodore H. Ingalls and W. Lloyd Aycock. New England Journal of Medicine, August 9, 1951.

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PHYSICAL THERAPY HOME CARE PLAN: ORANGE COUNTY (CALIFORNIA) HEALTH DEPARTMENT *Edward Lee Russell, M.D., and Helen Haiber* (5c)

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All requests should be addressed to American Physical Therapy Association, 1790 Broadway, New York 19, N. Y.

Abstracts

Use of Audio-Amplifier as a Means of Facilitating Work Output: Strength Development Through a Program of Progressive Resistance Exercise.

Anna Scott Hoye, Madison, Wis. In JOURNAL OF APPLIED PHYSIOLOGY, 4:3:215, September 1951.

Auditory stimuli are known to affect the living machine. The dynamogenic influence of music has been used throughout the ages in the motivation of activity. The ceremonial dance, war, industry, sports, and other expressions of human endeavor have revealed the energizing influence which may be attained through the use of rhythmic sounds. The emotional response created within the hearer is accompanied by certain physiological adaptations, the functional significance of which depends to a large extent on the character of the music as well as the susceptibility of the listener. Provided the emotional content is strong the effect may manifest itself in a variety of ways which aid in the augmentation of work capacity. Changes in heart rate, stroke volume, blood pressure, respiration, blood sugar level, secretion of adrenaline, metabolism, muscle tone, and others have been observed. Furthermore, music is capable of eliciting overt movement. It is apparent that the pattern of the response to emotion-provoking situations results in the activation of a greater number of efferent pathways than are stimulated even in supreme acts of volition.

The influence of autogenous auditory stimuli as an aid in the augmentation of work output was observed in 16 women subjects during a five-week training program of progressive resistance exercise based on DeLorme's technic. Each week consisted of four days of work, a limit day, and two rest days. The exercise studied was weight lifting. After a preliminary learning period, one half of the subjects comprising the experimental group were subjected to auditory stimuli created by amplification of action potentials elicited by the prime mover of the elbow joint during volitional flexion. The criterion of muscle strength was the maximal weight the subject could lift ten times and no more. Work was calculated by multiplying the load in kilograms by the number of lifts. Within the limits of this experiment, the following conclusions may be drawn: (1) Progressive resistance exercise augments work output. (2) Auditory stimulation in the form of sounds autogenously developed by the prime mover facilitate work output to a level which approaches statistical significance. (3) It is suggested that since the criterion of maximal functional capacity used is a gross measure of work output the problem warrants further study with refinement of technic.

Bell's Palsy: Etiology, Clinical Course, and Treatment

J. A. James, M.B., Edin., M.R.C.P., and W. Ritchie Russell, M.D., Edin., F.R.C.P. In THE LANCET, No. 6682, p. 519, September 22, 1951.

The clinical course followed by cases of Bell's palsy is briefly described: the lesion may be in the nature of a transient block, or it may progress to nerve degeneration, necessitating recovery by regeneration over a period of some months. The prognostic difference between these two main types of lesion is emphasized. Of a series of 58 cases which reached a hospital outpatient department, the two types of lesion occurred with about equal frequency.

It is quite evident that the only patients who always recover satisfactorily are those who have a transient block of the nerve, and in whom recovery is perfect within a few weeks. In all the other patients the nerves have to recover by regeneration, and this often gives unsatisfactory results from the cosmetic point of view.

In the first place, when the facial muscles recover after denervation they tend to develop some contracture, so that the face at rest is pulled slightly to the side formerly paralyzed. The nature of this contracture is still not certain. Since it varies from time to time, it has been thought that it is sometimes an irritative phenomenon, and may occasionally progress to facial hemispasm. It is an old belief that contracture is due to electrical treatment being continued for too long, but there is no good evidence to support this view, although it is generally agreed that electrical treatment should be stopped when voluntary movement shows signs of returning. Contractures may perhaps be aggravated by associated movements causing over-use of certain muscles: In the case of the patient who is constantly screwing up her eyes or raising her eyebrows, the associated movements of muscles around the mouth result in their being exercised more than on the normal side. Certainly a placid and relaxed facial expression should be cultivated in these cases.

Secondly, it must be emphasized that mass innervation of muscles inevitably develops to some extent when a nerve regenerates, and when this happens in the facial muscles the effect is likely to be disfiguring to a varying degree. The experiments of Howe *et al.* suggest that this mass innervation is due not only to axons becoming misdirected, but also to a splitting of axons at the site of injury. An embarrassing consequence of this mass movement is that when the patient smiles she appears also to wink.

Treatment can hope to be effective only if instituted within a few hours of the onset of palsy. The possible role of the stylomastoid vessels in the etiology is considered, and suggestions are made for further research.

Electromyography of Fatigue

G. Clinton Knowlton, Ph.D., Robert L. Bennett, M.D., and Richard McClure. In ARCHIVES OF PHYSICAL MEDICINE, 32:10:648, October 1951.

Observations by Cobb and Forbes showed that in rapid fatigue there is an increase in the amplitude of the summated action potentials of the exercising muscle. The relation of load and work rate to the fatigue electromyogram was not defined in that study and it is the purpose of this study to present the results of observations made on control muscles doing work to subjective fatigue with various loads and at several work rates. These results show that the electromyograph pattern of fatigue is definitely altered by changes in the work load and rate. On the basis of these results a test regime is described and some data obtained in a limited application of the test to poliomyelitis muscles are presented.

The amplitude of the electromyogram shows a progressive increase from the initial to the final contractions of control muscles carrying moderate loads to subjective fatigue.

The rate and extent, but not the direction, of this voltage change is

altered by changes in load and work rate, there being an intermediate load and rate where the voltage increase becomes maximal.

Using a load graded to the muscle strength and a rate of 58 lifts per minute, poliomyelitis muscles of grades G+ and F+ showed smaller voltage increases at fatigue than did control muscles. In general, the better the muscle grade the closer the response was to that of the control muscles.

Certain muscles of grades G— and F+ gave a reversed voltage response in that the action potential voltage decreased during repetitive contractions. In a few individuals this kind of response was associated with muscles which later decreased in strength during a functional exercise program.

The Rapid-Rocking Bed: Its Effect on the Ventilation of Poliomyelitis Patients with Respiratory Paralysis

Fred Plum, M.D., and G. Donald Whedon, M.D., New York. In THE NEW ENGLAND JOURNAL OF MEDICINE, 245:7:235, August 16, 1951.

Fifteen patients with respiratory insufficiency recovering from acute anterior poliomyelitis were transferred from tank respirators to rapid-rocking beds as soon as their temperature reached normal and they could breathe unassisted for five minutes. The periods of time spent out of the respirator and on the rocking bed were increased each day. As indicated by tidal volume and vital-capacity measurements, the rapid-rocking bed brought about marked increases in ventilation over that of the resting state. Although rocking produced tidal volumes that were not so great as could be attained by tank respirators, adequate effective alveolar minute ventilations were produced in all convalescent patients.

Substituting the rapid-rocking bed for the respirator early in convalescence facilitated nursing care and physical therapy, and prevented fixation of the diaphragm. Rocking aided the restoration of independent breathing and enabled several patients to overcome their dependence on the respirator.

The rapid-rocking bed was used in five patients in the *acute* stage of poliomyelitis with moderate respiratory insufficiency. Four had to be transferred to tank respirators in order to correct fatigue, carbon-dioxide retention or anoxemia. The rapid-rocking bed provided barely adequate ventilation for the fifth patient in the acutely ill group.

Frequent spirometry and serial determinations of carbon-dioxide combining power gave valuable information toward the regulation of artificial respiration in all patients.

A Comparative Study of the Rate of Atrophy of Skeletal Muscle Following Anterior Ramisection and Acute Anterior Poliomyelitis in the Rhesus Monkey: With a Note on the Weight of the Sartorius Muscle in the Normal Animal

R. E. M. Bowden. In BULLETIN OF JOHNS HOPKINS HOSPITAL, 89:3: 153, September 1951.

Although the histological changes following experimental poliomyelitis have been reported by several observers, there does not appear to have been any quantitative study of atrophy following this disease. It therefore seemed that a comparison of the rate of atrophy following anterior ramisection and acute anterior poliomyelitis might be useful from two points of view. Firstly, any striking differences might shed more light on the changes occurring in the affected muscles, particularly in the acute stages of poliomyelitis, and secondly, knowledge of the time course and degree of atrophy is an essential preliminary requirement for experimental evaluation of the various forms of physical therapy now used in the treatment of convalescent patients.

The rates of atrophy of m. sartorius, gastrocnemius and tibialis anterior have been studied in eleven monkeys after anterior ramisection. In all three muscles the rate appears to be similar.

An attempt has been made to study the rate of atrophy of the sartorius muscle in 40 cases of anterior poliomyelitis. Seventy muscles were available for study and in all cases they were completely paralyzed as judged by clinical tests and by stimulation of the motor nerve in some cases. The calculations are based upon an estimation of the weight of the muscle in the normal animal at the time of inoculation of the virus. The method has limitations which are discussed.

The degree and rate of atrophy of the sartorius muscle after poliomyelitis do not appear to differ significantly from those found following anterior ramisection.

There is variation between the weight of the right and left sartorius muscles in most monkeys. In the group of 86 animals the majority of muscles were found to vary by not more than 10 per cent of each other but this variation was as high as 20 per cent in a few cases.

In the group as a whole there was no evidence of dominance of either the right or left hind limb, but this cannot be excluded for the individual. There was some correlation between muscle weight and sitting height, but correlation is closer between muscle weight and body weight. The correlation between muscle weight and body weight is the same in the two sexes.

There is correlation between sitting height and body weight, and as might be expected, the weight at any given height tends to be influenced by the state of nutrition of the animal.

The Organization of Inpatient Rehabilitation at the Royal Air Force Medical Rehabilitation Unit, Headley Court

Squadron Leader P. J. R. Nichols, R.A.F., M.A., B.M., B.Ch. In THE BRITISH JOURNAL OF PHYSICAL MEDICINE, 14:10:219, October 1951.

A basic remedial program must be both rigid and elastic. This paradox is logical when you consider the commitments. It is essential to have thoroughly organized and rigid timetables for remedial class work, and equally important to cater to the variations and individuality of each patient. The main division of the patients is according to the severity of the disability. The patients who require individual supervision are treated almost entirely by the physical therapists. These are mostly cases of severe paralysis following anterior poliomyelitis, or multiple injuries in the early stages.

The actual timetable is built up of half-hour periods, preceded morning and afternoon by half-hour general "loosening-up" or "warming-up" physical therapy. The total remedial program for each patient consists of four to five hours per day, depending on the stage of recovery. This includes all activities, exer-

cises, games, physical therapy, hydrotherapy, and occupational therapy.

Great emphasis is laid on the team spirit; close understanding and cooperation between physician, physical therapist, physical training instructor, and patient are essential for good rehabilitation.

Specialization is the logical outcome of increasing knowledge. In medicine, specialization tends to reduce the physician-patient relationship to a formal consultation. I believe that rehabilitation, with its attempt to treat the physical, mental, and social effects of disability, may help to restore the medical profession to the status of guide, philosopher, and friend.

Changing Attitudes Toward Multiple Sclerosis: A Program of Management

Edward E. Gordon, M.D., and Karl E. Carlson, M.D., New York. In JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 147:8:720, October 20, 1951.

The attitude toward the course of multiple sclerosis is undergoing a change. The "classic" picture has emphasized the rapid progression, the swift onset of helplessness and early death. While such a portrait may apply to an individual case, it appears that the natural evolution, like the symptoms of the disease, is varied, and that many patients do retain usefulness for a long period of time. Moreover, when multiple sclerosis is studied in a group, the survival time appears to have been underrated; one recent statistical study indicates that the median duration of the disease is in the vicinity of twenty-seven years, a surprisingly high estimate in comparison with previous views.

No prediction as to immediate course and prognosis is possible in each individual case. Every patient must be given the benefit of the doubt to as liberal an extent as the judgment of the physician can permit. No one can foretell whether a given remission may not be the last, or whether it will not be maintained for many years. To improve the patient's situation, the technics developed in the field of rehabilitation may be utilized to teach the patient how to live with his residual capacities to the best of his ability.

It is generally conceded that physical medicine often is the most useful approach to the management of patients with chronic neurological diseases. This statement should be broadened to include suitable rehabilitative technics. The application of this branch of medicine is all the more important because of failure of any definitive medical treatment up to the present time. But treatment by default represents only a negative approach. Already mentioned is the necessity for regarding each individual patient as a possible candidate for rehabilitation, since one cannot determine the future course of the disease as regards speed of progression. Another justification for the management of multiple sclerosis by rehabilitative technics is the advantage of maintaining maximum physical activity.

The technics employed to teach the patient how to live with his residual capabilities may be summarized briefly as follows: (1) strengthening of residual motor units of a muscle, which are only partially removed from voluntary innervation but which are atrophied from disuse; (2) training of synergists for a particular motor pattern in which the neuronal connections to the prime mover are affected; (3) training of other muscles to perform movements to substitute for the normal prime movers irreversibly affected; (4) use of mechanical devices to compensate for disabilities in order to accomplish purposeful motion required for the numerous activities of daily living.

This method commonly is called "muscle reeducation." However, it is evident that one cannot separate the training of muscles from that of the whole central nervous system. Therefore, it may more properly be called "neuromuscular reeducation." In order to establish a program for neuromuscular reeducation, a detailed inventory of the disabilities must be made.

Repair of the Flexor Pollicis Longus Tendon

Francis H. McCullough, Jr., Lt. M.C., U.S.N. In UNITED STATES ARMED FORCES MEDICAL JOURNAL, 2:10:1579, October 1951.

This is a case report of a right-handed marine whose right hand was struck with metal fragments causing a compound fracture of the shaft of the middle phalanx of his middle finger and a compound chip fracture on the palmar surface of the distal phalanx of his thumb at the interphalangeal joint. There was no artery or nerve involvement, but he was unable to flex the distal joint of his thumb. An operation was performed to replace the flexor pollicis longus tendon to the distal phalanx of the thumb. A plaster cast was applied, after the operation, from below the elbow, immobilizing the thumb in opposition with the distal joint flexed. The cast and sutures were removed three weeks later. The distal joint could be extended from its flexed position only a few degrees. The patient was instructed to start passive extension exercises slowly, being careful not to exert too much tension while extending the joint. Four weeks after the operation the patient was able to extend the distal joint of his thumb to 165 degrees and flex it to 90 degrees. He was not given any formal physical therapy treatment, but was instructed in passive and active motion to the tolerance of pain to gain full extension of the joint. The fifth week after operation he was grasping a rubber ball and pressing the ball with the thumb, gradually increasing the amount of pressure by the long flexor tendon.

Six weeks after operation the distal joint of his thumb showed a full range of motion. He was able to grasp objects and hold them.

Early Recognition of Peripheral Nerve Injuries

Anielio F. Mastellone, Lt. Col., M.C., U.S.A., Raoul C. Psaki, Lt. Col., M.C., U.S.A., and John H. Kuitert, Lt. Col., M.C., U.S.A. In UNITED STATES ARMED FORCES MEDICAL JOURNAL, 2:10:1523, October 1951.

The prompt recognition of incidental nerve lesions is essential to total recovery, and their presence should be recorded when recognized. The absence of nerve lesions at the point of injury is equally important, and should likewise be noted. Early treatment of peripheral nerve lesions should not be allowed to interfere with saving life or limb but is required to prevent serious sequelas, often irreversible, such as contractures, stiffness and fibrosis of joints and muscles. Until such time as the patient arrives at a point in the chain of evacuation where definitive treatment can be administered, it is important to support the involved part. For the upper extremity a simple sling may give sufficient support

to prevent stretching of the paralyzed parts. A simple foot-drop splint may be all that is necessary in the lower extremity to preserve functional position. Contractures of muscles and tendons and stiffness of joints may be prevented by frequent passive movement of the involved parts through a full range of motion. If possible, the patient should be instructed to do this for himself.

From the beginning it is important to place a patient on a schedule of activity, teaching him exactly what he should do and how to do it. In the early acute stage rest is important, but must not be prolonged. As soon as exercise can be tolerated the patient should be taught actively to exercise muscle groups supporting affected joints so as to maintain good muscle tone and strength. The joints should be actively carried through a full range of motion. It may be necessary to begin with passive motion of the joint, graduating to active assistive, then active and active resistive exercises. Pain may be alleviated by heat, intravenous or intra-articular procaine, or other medication prior to the exercise period. Every effort should be made to make the patient ambulatory. It is the physician's responsibility to insist on this activity. It may cause discomfort, in which case the physician should seek measures to alleviate this discomfort. Undue fatigue is not to be allowed, but activity should be sufficient to maintain muscle tone and joint motion. This program of activity must then be augmented by periods of general bed rest for the patient and local rest for the affected part. For the spondylitic patient periods of bed rest on the Bradford frame should be prescribed.

The local rest of an affected joint is best obtained by a type of active elastic splint to be worn during the day between periods of exercise. They allow motion and exercise of the joint, maintain the joint in optimal position, and provide support for the part. In this way they assist in preventing the development of deformities and in the correction of deformities already manifested. These splints must be individually designed and require a great deal of ingenuity on the part of both the physician and the brace maker.

In order to encourage ambulation use can be made of walkers, crutches, and canes. Frequently the joints of the feet are involved and pressure can satisfactorily be taken off tender heels by the use of doughnut-type heel cushions in the shoes and from the tender metatarsophalangeal joints by the application of metatarsal bars to the soles of the shoes.

In addition to the general medical measures used to relieve pain and arrest the disease, much comfort can be obtained by the employment of physical therapy measures of mild heat in any form, such as hot packs, hot baths, heat cabinets, electric blankets, paraffin baths, infra-red and massage. Heat must be mild because high temperatures are more harmful than beneficial and, at times, dangerous. Heat is soothing, relaxes muscle spasm, and has an analgesic effect. Light massage improves tone and circulation and reduces edema. Iontophoresis was advocated by Stengel as the method of choice to relieve pain, spasm, edema, and thickening about joints, being superior to commonly employed physical therapy measures which he claimed are harmful at times rather than helpful.

Mild deformities and pain frequently can be corrected by traction, using Sayre head traction in cervical arthritis, and leg traction for deformities of the knee. Manipulation under anesthesia at times may be helpful to correct deformities and should be followed by active exercises to retain the motion gained. The use of wedging casts often is successful in the correction of deformities of joints whereby they may be returned to a position of usefulness. Static exercises are important even during the period of wedging to maintain muscle tone and strength so as to be capable of maintaining the corrected position when the casts are removed. As muscle tone, strength, and joint mobility improve, a variety of occupational therapy measures may be used to continue the improvement and provide a little variety to monotonous exercises.

Orthopedic Concepts in the Management of Rheumatoid Arthritis

Joseph W. Batch, Colonel, M.C., U.S.A. In UNITED STATES ARMED FORCES MEDICAL JOURNAL, 2:10: 1447, October 1951.

A rheumatology clinic should be established at any clinic or hospital which manages more than an occasional arthritic patient. This clinic should comprise the rheumatologist, the orthopedic surgeon, the physiatrist, and, occasionally, the radiologist, and psychiatrist.

As a general rule, during the early, active, acute phase of the disease conservative measures are indicated. Rest of the acutely inflamed joint has been the time-honored key to the treatment of such joints, but it has become so ingrained in the minds of most physicians that its use has been greatly overdone with the production of harmful end results, in the form of deformities and invalidism, even though attempts have been made to maintain optimal position of joints. Rest, both general, as obtained by bed rest, and local as obtained by casts and splints, is still a very helpful measure in the treatment of arthritis. Rest must be employed judiciously by the physician and balanced by a well conceived plan of activity. Periods of bed rest throughout the day alternated with periods of activity are to be prescribed, but complete bed rest should be discouraged or prevented. The patients must be encouraged to exercise their joints even though such activity causes some discomfort, but not to a point of causing an exacerbation of symptoms.

Arthritic joints are painful and most patients are prone to keep them at absolute rest and assume a flexed position of the joints to prevent pain. Unfortunately, these positions of deformity often are encouraged by physicians and nurses in an attempt to make the patient comfortable.

Objective Recording of the Strength of Normal Muscles

Earl C. Elkins, M.D., Ursula M. Leden, M.D., and Khalil G. Wakim, M.D., Ph.D., Rochester, Minn. In ARCHIVES OF PHYSICAL MEDICINE, 32:10:639, October 1951.

Certainly there is a need for standard, objective tests for the evaluation of muscular strength. This presentation is a report of progress in that direction. However, there are many factors involved in the measurement of either normal or abnormal muscular strength. It is difficult to devise an exact, objective method for the measurement of strength which will be satisfactory to all testers. A great number of studies would have to be made on many subjects in order to establish what strength is necessary in certain muscles to produce normal function of a given part. In these studies it is hoped that optimal positions for the function of normal muscle can be established and applied to the testing of muscular strength in neuromuscular diseases.

The instrument used for measurement of power was comparatively simple, and the tests could be duplicated easily. The method is completely objective, since the power measured is that of the strength of the subject only, and not dependent on the application of any outside force. The amount of power that can be measured is not limited by the instrument, as in the use of the Newman myometer, nor by the strength of the operator, which may be the case when the Beasley myodynamometer is used.

Any use of instrumentation to determine muscular strength requires considerable time for the test and makes it cumbersome.

These studies corroborate the curve of strength found previously in the elbow flexors, and the angle at which the elbow flexors function with greatest strength. From the standpoint of function, it may be assumed that the elbow flexors exert the greatest power when the elbow is at a right angle, since this is the most frequent position used in producing maximal strength in everyday activity. There was a slight difference in strength when the forearm was in the supinated position, pronated or midposition, but this was not of great significance.

The findings in the measurement of the elbow extensors were somewhat as expected; namely, (1) that the triceps are considerably weaker than the flexors of the elbow; (2) that they are in a position to produce their maximal power when they are under minimal, or near minimal, length and tension. It was not clear why the shoulder abductors were more efficient in the sitting position. It may be argued that there was not sufficient stabilization of the trunk. However, it was impossible to stabilize compietely the action of the muscles of the trunk when the subject was in either the supine or the sitting position.

The power of the hip flexors should be greatest at the angle at which they are near their greatest length, where they still have a few degrees of flexion in order to have a strong rotary component. In acute flexion of the hip, all of the groups of muscle acting in flexion would be at a distinct disadvantage because of the loss of length and tension. The findings obtained from these various muscle groups indicated that muscles functioning at optimal power are not always at greatest length and tension; rather, they function best in the optimal physiologic position.

Studies in Experimental Frostbite: VII: An Inquiry into the Mode of Action of Rapid Thawing in Immediate Treatment

Robert E. Lempke and Harris B. Shumacker, Jr. In ANGIOLOGY, 2:4: 280, August 1951.

Of all the methods of treatment which have been subjected to controlled study in experimentally induced frostbite, rapid thawing of the frozen extremity has proved to be by far the most efficacious. Its beneficial effect has been evident in experiments carried out in a variety of species and has been confirmed by nearly all investigators who have studied the problem. In this investigation the authors attempt to throw light upon the mode of action of this therapeutic measure in general and more particularly to try to provide an answer to the question whether rapid thawing is effective merely because it decreases the length of time during which the tissues are frozen or because of other effects.

The experiments reported and the related observations cited from the literature would appear to warrant the following conclusions:

(1) The period of actual freezing does not appear to be an important factor in the survival of single-celled organisms. The incidence and extent of gangrene which may result from freezing of tissues in the living mammal does appear to be related directly to the duration of the period of actual freezing, though this relationship may not be dependent upon the duration of the frozen state *per se* but rather upon certain related phenomena, such as the extent of the area frozen, extent and persistence of the resulting vasoconstriction, and the completeness and duration of the resultant capillary stasis.

(2) Though the efficacy of rapid thawing in the treatment of frostbite is probably dependent to some extent upon its effect in shortening the duration of the period during which the tissues are actually frozen, its effect seems definitely to be due in part to other factors. These additional factors are not well understood but there are available data to suggest that the following may be at play: Tissues tend to tolerate poorly a temperature at, or near, the freezing point and rapid thawing shortens the period during which the tissues are in this temperature range. The rapid change from the frozen state to optimal temperatures appears to be attended by better physico-chemical restitution of cells than the slow transition between these states. Rapid thawing brings about prompt vasodilatation, cuts short the period of vasoconstriction which tends to follow frostbite, delays and inhibits capillary stasis, provides the anoxic tissues immediately with the best possible blood flow, and minimizes the likelihood of subsequent vascular thrombosis.

The Cerebrovascular Accident: A Review of Some Pathological and Clinical Problems

A. Theodore Steegmann, M.D., Kansas City, Kansas. In THE JOURNAL OF THE KANSAS MEDICAL SOCIETY, 52:10:473, October 1951.

The treatment of a cerebrovascular accident must be approached as an individual problem. It is an advantage to be familiar with the symptoms and condition of the patient preceding a stroke, an advantage the family physician may have over the specialist. We cannot be certain, but it seems probable that weight reduction, particularly in hypertension, avoidance of strain and excitement and a more leisurely life may delay, if not prevent, a stroke in some cases. Certainly cardiac reserve, kidney sufficiency, and the average level of the blood pressure are important considerations in treatment. Many arteriosclerotic patients seem to live more happily and comfortably when treated with regular doses of caffeine, phenobarbital, and nicotinic acid, or other vasodilators.

Steegman is convinced that a large percentage of patients who have strokes do not get the best medical management. The patient with a cerebral hemorrhage is going to suffer from shock and cerebral tissue injury, and his fate will be determined by the site and degree of hemorrhage regardless of the treatment employed.

In patients with thrombosis, the same initial procedures as used in the treatment of cerebral hemorrhage are employed, and early ambulation, muscle reeducation, and exercise will restore many to useful lives. Before the ambulant stage, contractures of muscles and fibrous ankylosis of the joints of the paralyzed limbs can be prevented by daily passive motion, stretching, and massage. The prognosis, in general, is better in patients with encephalomalacia, but the site and extent of the lesion will determine the outcome. Medical treatment aims towards maintaining good circulation in as much of the ischemic tissue as possible.

Arterial Hypertension Associated with Acute Anterior Poliomyelitis

Fletcher H. McDowell, M.D., and Fred Plum, M.D., New York. In THE NEW ENGLAND JOURNAL OF MEDICINE, 245:7:241, August 16, 1951.

Arterial hypertension, with a diastolic blood pressure greater than 90, appeared in 45 of 95 adolescents and adults with acute anterior poliomyelitis. Males were twice as frequently affected with hypertension as were females.

The highest incidence of hypertension occurred in patients suffering bulbospinal paralysis or paralysis of all four extremities; 29 of the 30 patients requiring artificial respiration developed arterial hypertension.

The appearance of arterial hypertension in these patients may have been the result of invasion of brainstem autonomic structures by poliomyelitis virus, or may have been a manifestation of a generalized alarm reaction. Anoxemia, hypercapnia or artificial respiration appeared to intensify and prolong the otherwise transient hypertensive state that occurred.

Primary Involvement of the Upper Extremities in Thromboangiitis Obliterans

Eugene M. Farber, M.D., and Millard H. McLain, M.D., San Francisco. In ARCHIVES OF DERMATOLOGY AND SYPHILOLOGY, 64:3:352, September 1951.

Thromboangiitis obliterans (Buerger's disease), limited primarily to the upper extremities, is rarely seen. Recently two patients were observed with this disease of the upper extremity, neither of whom had clinical evidence of involvement of the lower extremities. In both patients painful ischemic ulcers of the finger tips developed. The lesions became infected and were treated as pyodermaia until underlying vascular disease was recognized.

In typical cases of thromboangiitis obliterans, 40 per cent of the patients suffer from arterial disease of the upper extremities in association with occlusive arterial disease of the lower extremities. It is unusual for the disease to develop in the hands clinically before there are symptoms referable to the legs. Constam reviewed the clinical findings of 94 patients with the disease and reported that in four of this group signs and symptoms of thromboangiitis obliterans of the upper extremities developed before the lower extremities were involved.

The diagnosis of thromboangiitis obliterans of the digital type was made in these two cases on the following evidence: organic occlusion of a medium-sized artery, Raynaud's phenomenon, intermittent pain of the hands, and presence of superficial painful ulcers.

Early recognition of this disease as a cause of ulceration of the digits of the hands is important because early recognition with adequate treatment may prevent the loss of a finger or a limb.

Effect of Anodal and Cathodal Current and Novocain Ion Transfer on Tension Produced in Muscle by Direct Electrical Stimulation

Jerome W. Gersten, M.D., M.S., Denver, Colo. In ARCHIVES OF PHYSICAL MEDICINE, 32:10:633, October 1951.

In the experimental animal, the beneficial effects of electrical stimulation of denervated muscles have been carefully described. Such effects include increase in diameter of the muscle fiber, increase in muscle weight and power, decrease in the amount of fibrosis, decrease in water content, increase in oxygen consumption, and lesser fatigability. The sine wave, with a frequency of approximately 25 cycles per second, has been found the most effective in producing these favorable structural and functional changes. One of the most important factors in attaining the desired therapeutic end seems to be the development of sufficient tension during contraction. It has been suggested that the above observations may not apply to man, since the current intensities required to produce vigorous contractions never could be employed in a patient.

This study was made primarily to determine in man the amount of tension which could be produced in a muscle by stimulating it electrically, and the effect of constant current and procaine (Novocain) hydrochloride ion transfer on the tension resulting from such electrical stimulation.

Tension developed in the normally innervated elbow flexors on electrical stimulation was studied at frequencies varying from 2 to 360 cycles per second. Maximal tension was developed, on the average, at stimulation frequencies of approximately 50 to 60 cps.

A decrease in tension on electrical stimulation could be produced by "anodal current." When such a current was applied to the elbow flexors the tension produced in these muscles on electrical stimulation was decreased, while on application to the triceps the tension in the elbow flexors was increased.

The increase in tension in the elbow flexors was slightly greater when "anodal current" was applied than when Novocain ion transfer was applied to the triceps, while with "cathodal current" to the triceps the effect was least.

Present Needs of the Veterans Administration in Physical Medicine and Rehabilitation

A. B. C. Knudson, M.D., F.A.P.A., F.A.C.P., Washington, D. C. In ARCHIVES OF PHYSICAL MEDICINE, 32:10:632, October 1951.

The scope and complexity of the Physical Medicine and Rehabilitation Service in the Veterans Administration has been presented. The numerous problems we have at this time have been briefly described. We know that as some of them are solved others will develop. We wish to emphasize the excellent and unsurpassed opportunity for service to veterans and for professional development in Physical Medicine and Rehabilitation in the Veterans Administration; opportunity for clinical work, teaching, research and effective administration.

There are approximately 576 qualified physical therapists on duty in hospitals and regional offices. Up to April 1951, fifty of this personnel had been called to military duty. Several of the qualified physical therapists recalled to military duty were lone workers in their respective hospitals, leaving this important therapy unavailable for patients. So far only seven qualified replacements have been obtained.

Constructive criticism is welcomed so that we may further improve this specialty in the Veterans Administration. Help is sincerely solicited whether it comes from within or without the Veterans Administration in enabling us to meet these needs, and especially in the procurement of qualified personnel to do the job.

The Use of Intravenous Mephenesin (Tolserol(R)) in Physical Medicine: A Clinical and Laboratory Study

Sedgwick Mead, M.D., Emily E. Mueller, M.S., R.P.T., and Alex Harell, M.D., St. Louis, Mo. In THE BRITISH JOURNAL OF PHYSICAL MEDICINE, 14:10:223, October 1951.

As a result of clinical and laboratory study on the use of intravenous mephenesin (Tolserol(R)) in 38 patients complaining of low back pain or painful shoulders with limited movement, we have come to the following conclusions:

The intravenous use of mephenesin is a valuable analgesic and aid to certain physical medicine procedures for a limited group of patients.

The oral ingestion of mephenesin does not appear to have much effect on the relief of pain.

Intravenous mephenesin is more effective in acutely painful, severely disabling conditions than in chronic states with severe contractures and those manifesting little or no pain.

Laboratory studies do not support the thesis that pain relief occurs by relaxation of muscle spasm or by elevating the pain threshold.

There is some evidence that such relief of pain may result from relaxation of vasospasm.

An Over-Bed Reading Device

Roy H. Nyquist, M.D., and Earl Clifton, Long Beach, Calif. In ARCHIVES OF PHYSICAL MEDICINE, 32: 9:597, September 1951.

The problem of developing devices to facilitate rehabilitation activities frequently arises in the rehabilitation of quadriplegic spinal cord patients. One device found to be most useful in the Long Beach Veterans Administration Hospital is the "over-bed reading device," which is useful to patients having limited use of the upper extremities.

The device, which is described in detail, makes it possible for patients to read without excess strain or effort. If the patient has some use of his hands, he can turn pages for himself. If he is unable to turn the pages, he will need some assistance from ward attendants. Without this device the patient would need assistance during the entire reading period; with the device, he will need assistance at intervals only, thus relieving personnel to perform other duties.

Foreign Abstracts . . . .

The Application of Galvanism. *By Dr. Jules J. Klain (The Hahnemannian Monthly, 1950) Revista De La Sociedad Argentina De Medicina Fisica Y Rehabilitation, No. 49-50 Quarterly 1951. (Translated and abstracted by Erle L. Williams, Head of Department of Physical Therapy, John A. Andrew Memorial Hospital, Tuskegee Institute, Ala.)*

The application of galvanic current could be summed up in the following: reaction of muscular changes of the body and resulting chemical changes. The chemical action is of ionic nature similar to the production of electric current in electrolysis, and is due to the direct action of the two poles acting upon a substance that can be ionized. It is possible to make use of ionizing effects of each of the poles in the treatment of the various diseases and ailments of the human body. The most modern method of producing galvanic current is through a rectifier of electric current, similar to that used in radio receptors to change alternate current to direct current.

Today the galvanic current is extensively used in medicine by regulating its polarity effects. The negative pole is employed in the treatment of eruptions and erosions of ulcerations, eradication of excessive hair, etc., by taking advantage of its caustic and liquefying properties. The positive pole has a sedative effect in the nerve endings and has been used in the treatment of such painful affections as neuralgia, neuritis, etc. For a long time it has been known that positive galvanism is efficient in the treatment of the chronic otorrhea. Zinc sulphate solution is applied to the passage of the middle ear with a zinc rod which is thoroughly wrapped in cotton and soaked in $ZnSO_4$ solution. Recently it has been recommended in the ionization of nasal membrane in the treatment of hay fever. In this case, a special solution or jell of zinc sulphate is introduced into the nostril with a zinc rod as an electrode attached to the positive pole from the galvanic generator. The negative pole may be placed in any part of the body as, for example, the arm or on the posterior aspect of the neck. When the current is allowed to flow, the ionization of the zinc salt which was placed in the nasal cavity distributes zinc over the mucous membranes, resulting in diminishing the sensibility of those membranes to the allergic manifestations. The treatments are painless and their effects surprisingly lasting. A copper sulphate solution may replace the zinc solution in hay fever treatments.

When any type of galvanic current is used, one should take under consideration these rules. Do not use solutions that are too highly concentrated. See that the connections and the wires are secure. The amount of current that flows varies in different cases. As a general rule, the amount of current that is comfortable to the patient is sufficient to bring about ionizing effect.

Fussgymnastik mit Kindern (Foot Exercises with Children). By Martha Scharll. George Thieme Verlag, Stuttgart, 1951, 20 pages, 26 photographs. Price DM 2.90. *(Translated and abstracted by Sigue Brunnstrom, Director of Physical Therapy, Kessler Institute for Rehabilitation.)*

This small publication in pamphlet form has an introduction by Professor Georg Hohmann, M.D., Muenchen, who recommends it warmly not only to remedial gymnasts but also to mothers for use at home in teaching their children feet exercises.

The photographs illustrating the exercises are clear and, in most cases, self-explanatory. The text is limited to a few lines accompanying each photograph. Although a few anatomical terms are used for the benefit of the professional reader, the text is simple enough to be instructive also to the layman.

The importance of pressing down the ball of the big toe as the arch is pulled up, rather than keeping the body weight entirely on the outer border of the foot, is stressed and well illustrated. Specific exercises as well as games with balls, pebbles, sticks, and ropes are illustrated.

The booklet is obtainable from Grune and Stratton, Inc., Medical Publishers, New York.

Book Reviews . . . . .

Parents' Study Guide *(A Manual for Parents of Cerebral Palsied Children). Prepared under the direction of Verna S. Carlisle. Paper binding. Price, $.50. Pp. 74. The National Society for Crippled Children and Adults, Inc. Chicago, 1951.*

This manual is exactly what the title implies. It presents a guide to nineteen meetings in outline form. Each contains an excellent list of source materials, including films, books, magazine articles, and pamphlets, telling where they may be obtained, and their price. With few exceptions, this material is up to date; most of it has been published within the last five years.

Stress has been placed on the need for leadership, both within the parent group, and by experts in the various specialties. This reviewer would emphasize that the speech therapist should also be a person with cerebral palsy training.

Another section lists publications for the parents' book shelf. The list is comprehensive, and again tells where material may be obtained and the price. These are not technical books, but it is stated that such a list may be obtained from the society. Some of this material is broad in scope and would be of value to parents of children with handicaps other than cerebral palsy.

The written material in this manual is brief, and serves largely as an introduction to the outlines and source material. It stresses the need for parents to learn and grow with their children, rather than to depend wholly upon experts. The plea is made for an understanding first of the growth and emotional needs of normal children, then for those of the handicapped.

Reviewed by PEGGY RUSSELL, *Physical Therapist, A. Harry Moore School, Jersey City, N. J.*

Current Therapy 1951. *Edited by Howard F. Conn, M.D., Hard cover; price, $10.00; pp. 699. Published by W. B. Saunders Co., Philadelphia, 1951.*

Keeping abreast of advances in medicine is becoming more and more difficult. This type of volume fills a much needed place. The treatment of each disease process is discussed by two or more authorities in that particular field. All contributors have adopted a modified outline form which makes for clear, understandable reading. Drugs and dosages and physical therapy measures, where indicated, are accurately described. This is a good quick reference book and is recommended for any general department of physical medicine.

Reviewed by HARRIET E. GILLETTE, M.D., *Medical Director of Children's Rehabilitation Center of Georgia.*

Manual of Massage and Movements. *By Edith M. Prosser, T.M.M.G., Trained Nurse and Certified Midwife. Member of Council of Chartered Society of Massage and Medical Gymnastics 1936–44. Sister in charge Massage Department and Principal of School 1930–49, continuing Examiner for Chartered Society of Physiotherapy at the Middlesex Hospital, London since 1928. Price, $5.00. 388 pages, 287 illus. J. B. Lippincott Co., Philadelphia, 1951.*

The author responsible for this third edition began with an excellent idea and then executed it well. She has found through her relationship with students that all too often massage and movements, especially the former, have held the least interest. Therefore, she has written this book for a threefold purpose.

First, to stimulate interest in and inculcate a working knowledge of the basic principles needed in giving massage and movement. A thorough understanding of the basic principles for giving these treatments is necessary in order to properly use and select the technic for intelligent treatment. Secondly, to emphasize the importance of progression in treatment in time, dosage and technic used; all of which depend upon the diagnosis, its severity and the progress of the individual patient. Thirdly, to keep alive the science of massage by knowing how, when and how long to use this form of therapy. It can easily fall into "disrepute because of faulty and ineffectual technic."

The book is a comprehensive, concise and clear guide of theory and technic. It is for the reader who already has a knowledge of anatomy, physiology, and pathology. The early chapters deal with massage and passive joint motion, the simplest and earliest type of movement and the successive chapters graduate through the various classifications of motion as we know them with a concurrent graduation from simple fundamental positions through more complex positions. In order to facilitate understanding it was necessary to analyze complex movements from simplest elements noting bones, joints, and muscles involved, and under what mechanical conditions the work is done. A concise and adequate excursion into the field of mechanics was necessary by the author to make the reader familiar with the problems of leverage and of the composition and resolution of forces.

The reviewer feels that there may be difficulty in understanding the technic of some of the individual massage movements, if the reader is not already familiar with them. Aside from that, the remaining material on massage is very well done. The suggested plan for massaging each part of the body followed by modifications and how to adapt them to the treatment of various surgical and medical situations is of utmost value, especially for the new graduate.

Unlike the chapters on massage, the remainder of the book has copious visual aid material in the form of match-stick diagrams. They make for interest and ease in understanding of body motion especially where muscles are attached.

The final three chapters deal with spinal deformities, giving the important principles of treatment and also including exercises illustrating progression for each deformity.

An appendix is included which beautifully illustrates and explains the "muscle work of walking."

It is the opinion of the reviewer that this is a most worth while book for the student and graduate physical therapist. Instructors in kinesiology, therapeutic exercise and massage also should find it most beneficial as a reference text and study guide.

Reviewed by MARY E. CALLAHAN, *Associate Director of Training Courses for Physical Therapists, College of Physicians and Surgeons, Columbia University.*

Corrective Therapy for the Handicapped Child. *By Eleanor B. Stone and John W. Deyton, M.D. Eleanor B. Stone is Instructor in Education, New York University, and Teacher of Health Education, Seward Park High School, New York City. John W. Deyton, M.D. is Medical*

Director, Michigan Chapter, National Multiple Sclerosis Society. Hard binding. Price, $5.00. Pp. 315 with 63 illus. Prentice-Hall, Inc., New York, 1951.

The importance of therapeutic exercise in pediatrics has been definitely established for some time. This book gives an excellent summary, detailed description and review of indications and applications of corrective therapy in this field. The wider implications of corrective work in rehabilitation of the handicapped child is taken into consideration. An excellent bibliography and good illustrations complete the book.

The "Contents" includes such chapters as: The School Rehabilitation Program; Social Adjustment of the Physically Handicapped; Personality Development and Mental Health; Anatomy, Kinesiology, and Physiology of Activity; Posture and Detection of Postural Deviations; and special chapters on pathological entities including Poliomyelitis, Cardiac Conditions, and Cerebral Palsy.

This book will be of definite value not only for the physiatrist and students of physical therapy but to the large number of specialists interested in the rehabilitation of the handicapped child.

Reviewed by HANS KRAUS, M.D., *Assistant Professor of Physical Medicine, New York University-Bellevue Medical Center, New York City.*

(Editor's note: The subject matter of this book is considered to be within the field of adapted physical education, which might have furnished a more truly descriptive title.)

You and Your Heart. *A Clinic for Laymen on the Heart and Circulation. By H. M. Marvin, Ph.D., and others. Foreword by Paul D. White. Cloth; price, $3.00; pp. 306 with 2 illus. Random House, New York, 1950.*

This little book contains a clear, factual approach for the layman's understanding of heart disease in general. It is written in a non-technical, conversational style and deals with aspects of heart disability familiar to all. While many types of conditions are mentioned, special emphasis is placed on coronary artery disease, rheumatic fever, and congenital conditions. While not profusely illustrated, it does contain a neat, diagrammatic outline of the heart which makes clear much of the text.

Contained in the last section is an interesting discussion of some of the common fallacies, misunderstandings, and untruths about heart disease. This particular material should be of value to many whose ideas and fears of "heart attacks" has been based on rumor and imagination.

While this text has little value to the physical therapist from a professional stand-point, it should prove interesting from a personal view.

Regional Orthopedic Surgery. *By Paul C. Colonna, Professor of Orthopedic Surgery, University of Pennsylvania Medical School. Cloth; price, $11.50; pp. 706, illus. 474. Published by W. B. Saunders Co., Philadelphia, 1950.*

This book presents clearly and specifically the total picture of the diagnosis, problems, and clinical treatment of a comprehensive number of orthopedic conditions. It is obviously arranged as a teaching device, reflecting Dr. Colonna's experience and technic in the presentation of such material to students of orthopedic surgery. His regional approach, which he states has been found to be most successful when used with both undergraduate and graduate students, is clearly evident in this text.

The initial material covers a detailed discussion of basic bone and joint physiology and relates it very successfully to the final orthopedic surgical treatment. The text also contains a minute description of the orthopedic examination including material on the importance and the method of functional muscle testing. This latter phase of the book will be of particular interest to the physical therapist.

The section dealing with specific surgical technic and clinical treatment should provide a valuable reference source toward the clearer understanding of operative procedures and permit the physical therapist to better understand the reasons for eventual treatment.

The Burden of Diseases in the United States. *By Alfred E. Cohn, Member Emeritus, Rockefeller Institute for Medical Research, and Claire Lingg, Secretary, Former Committee on Research, New York Heart Association. Hard binding; price, $10.00; pp. 129, illus. 39. Published by the Oxford University Press, New York, 1950.*

This outstanding book with multiple graphs and a separate folder of colorful charts is indicative of the zeal, interest, and time spent by the authors in compiling information covering a one-hundred-year period. Personally, I feel that the title is misleading, and for this reason, may by-pass the medical student, the doctor, public health personnel, and statisticians.

It covers in detail information obtained from vital statistics on the incidence of diseases, not only in the United States, but in the world. This is done according to age, sex, and classification of predominant causes of death from one hundred years ago to the present, giving causes and racial aspects. The graphs or curves so accurately compiled demonstrate that, with all advances in preventive measures and scientific research for treatments, there is still a considerable lack of organization throughout the world in proper functioning health departments, and public and professional cooperation.

It clearly shows that the causes of death fifty-or-more years ago have changed, as have the main diseases, and points out the differences between diseases of young people and geriatric maladies. Little of importance has been omitted which will be of value for future reference or research in the field of public health.

The contents, in addition to the introduction, include:

1. The international list of causes of death and changes in nomenclature.
2. The value of statistical statements.
3. Population and death rate
   Birth rate
   Life expectancy.
4. Leading causes of death in: a) Infancy, b) preschool age, c) school age, d) apprenticeship, e) journeymen workers, f) master workers, g) maturity (45 to 54, 55 to 64), h) age of wisdom (65 to 74), i) retirement, j) summary.
5. Race
6. Sex
7. The course of events in specified fields of diseases: a) Infectious diseases and pneumonia, b) tuberculosis, c) appendicitis, d) diarrhea and enteritis, e) the heart, kidney, and blood vessels, f) cardiovascular renal diseases, g) intracranial lesions of the vascular system, h) senility, i) other circular diseases, j) cancer, k) diabetes mellitus, l) accidents

8. Shape of curves as related to diseases.
9. Numerical changes in selected causes of death.
10. Morbidity: a) Surveys, b) mental illness.
11. Summary — addendum, notes and references.

The authors are to be congratulated for the excellent preparation of this book, and splendid charts, which could be framed and used as permanent record by the individual reader, or for public health offices. The publisher also is entitled to commendation for the artistic bookbinding, print, paper, and colorful charts. It has been a pleasure to review this excellent book.

Reviewed by CONSTANTINE G. PSAKI, M.D., *Chief, Physical Medicine and Rehabilitation, Veterans Administration, Philadelphia.*

What's Its Name? *A guide to speech and hearing development. By Jean Utley, Ph.D., Associate Director, Speech and Hearing Rehabilitation Clinic, College of Medicine, University of Illinois, Paper binding (spiral). Price, $2.00; pp. 172. University of Illinois Press.*

This workbook is skillfully designed and arranged by the author as a tool to help in training the handicapped child in speech and hearing. The brief introduction describes the place that this training holds in the care and development of the child, and is well directed to the parent or other individual who, although not professionally skilled in speech or auditory training, is in a position to contribute to the child's training. The workbook appears simple to understand and use; however, it would be wise to have the speech therapist or other qualified personnel explain its contents and use to the person who will apply this training approach.

The manual is composed of simple word pictures which are arranged two to a page. The arrangement is in relation to the difficulty in recognition of articles or objects, and upon the production of sound in the spoken word. As he becomes familiar with its contents, the child may handle this manual as he would a coloring book. Suggestions for the use of recordings and nursery rhymes are also included.

This is not a textbook or a reference book, but it should be a valuable tool for parents and others who may use it to train the child. It should be used upon the advice and direction of the professional specialist.

Index to Current Literature (Continued from page 92)

Poliomyelitis Following Tonsillectomy: Report of Six Cases. L. S. Goerke, M.D. Annals of Western Medicine and Surgery, September 1951.

Arthritis and Rheumatism

Arthritis—Orthopedic Aspects. J. Neille Garber, M.D. Journal of the Indiana State Medical Association, March 1951.

Cerebral Palsy

Cerebral Palsy—Spasticity. W. L. Minear, M.D. Rocky Mountain Medical Journal, October 1951.

A Synopsis of Basic Factors of Cerebral Palsy. Champe C. Pool, M.D., and J. George Furey, M.D. The Pennsylvania Medical Journal, October 1951.

Geriatrics

Conservation of Our Aging Population. Clark Tibbitts. North Carolina Medical Journal, October 1951.

Heat and Cold

Nephrosis Following Experimental Local Cold Injury. Lt. Col. R. B. Lewis, USAF(MC), and Col. R. M. Thompson, USAF(MC). The Military Surgeon, October 1951.

Miscellaneous

The First John Stanley Coulter Memorial Lecture. K. G. Hansson, M.D. Archives of Physical Medicine, October 1951.

Spastic Paraplegia in Late Adult Life. J. D. Spillane, F.R.C.P., and G. H. T. Lloyd, M.R.C.P. The Lancet, October 13, 1951.

Physical Medicine and Rehabilitation. Harry Kessler, Lt. Col., M.C., U.S.A.R. The Military Surgeon, November 1951.

A National Program for Training Public Health Personnel. E. S. Tisdale. Public Health Reports, U. S. Public Health Service, October 19, 1951.

A Method of Calculating the Body-Weight. B. O. Scott. British Journal of Physical Medicine, October 1951.

Community Planning and the Handicapped. S. S. Norwick, M.D., and M. W. Thomas, R.N. Public Health Nursing, October 1951.

Orthopedics

A Sectional Leg Splint. Lt. Comdr., M.C., U.S.N.R. United States Armed Forces Medical Journal, October 1951.

Concept and Management of Low Backache. W. B. Parsons, M.D. The Canadian Medical Association Journal, July 1951.

Peripheral Vascular Diseases

Thrombo-Embolism: An Analysis of Cases at the Charity Hospital in New Orleans Over a 12-Year Period. Alton Ochsner, M.D., Michael E. DeBakey, M.D., Paul T. DeCamp, M.D., and Eudorico da Rocha, M.D. Annals of Surgery, September 1951.

Rehabilitation

Rehabilitation and Nursing. M. K. Clement, R.N. Public Health Nursing, October 1951.

Ultraviolet

Ultraviolet Light in TB Prevention. M. B. Lurie, M.D. Bulletin of the National Tuberculosis Association, October 1951.

Schools of Physical Therapy

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OF THE AMERICAN MEDICAL ASSOCIATION

Graduates of these schools are eligible for membership in the American Physical Therapy Association.

Name and Location of School	Medical Director and Technical Director	Entrance Requirements	Length of Course	Classes Start	Certificate, Degree, or Diploma
CALIFORNIA					
[1]**Childrens Hospital Society,** Los Angeles (in affiliation with University of California, Los Angeles)	Samuel S. Mathews, M.D. Mary J. Dodge	a[3]-b[3]-d-e g[4]	14 mo 4 yrs	Sept	Certificate Degree
[1]**College of Medical Evangelists,** Loma Linda	F. B. Moor, M.D. R. Wm. Berdan	a-b-c-d-e g	15 mo 4 yrs	Sept	Certificate Degree
[1]**Univ. of So. California,** Los Angeles	Charles L. Lowman, M.D. Charlotte W. Anderson	a-b-d-e g[4]	14 mo 4 yrs	Sept Sept-Feb	Certificate Degree & Cert.
[1]**Univ. of California Medical School,** San Francisco	Lucile M. Eising, M.D. Margery Wagner	d-e g	12 mo 4 yrs	Sept	Certificate Degree
[1]**Stanford Univ.,** Palo Alto	Wm. Northway, M.D. Lucille Daniels	a-d-e-f g[4]	12 mo 4 yrs	Jan-June or Sept	Certificate Degree
COLORADO					
[1]**Univ. of Colorado Medical Center,** Denver	Harold Dinken, M.D. Dorothy Hoag	a[3]-b-d-e g[4]	12 mo 4 yrs	Sept	Certificate Degree
ILLINOIS					
Northwestern Univ. Medical School, Chicago	Emil D. W. Hauser, M.D. Gertrude Beard	a-b[3]-d-e	12 mo	Oct	Certificate
IOWA					
[1]**Univ. of Iowa,** Iowa City	W. D. Paul, M.D. Olive C. Farr	b-e	12 mo	Sept	Certificate
KANSAS					
[1]**Univ. of Kansas School of Medicine,** Kansas City	Donald L. Rose, M.D. Ruth Monteith	a-b-d-e g[4]	12 mo 4 yrs	Feb-Sept	Certificate Degree
MASSACHUSETTS					
Bouve-Boston School of P.E., in affiliation with Tufts College, Medford 55	Howard Moore, M.D. Constance K. Greene	g[4]	4 yrs	Sept	Degree
Simmons College, Boston	Wm. T. Green, M.D. Arthur L. Watkins, M.D. Shirley Cogland	a[3]-b-d-e g[4]	16 mo 4½ yrs	Sept	Certificate Degree
Boston Univ.-College of Physical Education for Women, Sargent, Cambridge	Kenneth Christophe, M.D. Adelaide McGarrett	a-b-d-e f-g[4]	12 mo 2 or 4 yrs	Sept	Certificate Degree
MINNESOTA					
[1]**Univ. of Minnesota,** Minneapolis	Frederic J. Kottke, M.D. Ruby Green Overmann	d-f-g[4]	2 yrs	Sept	Degree
[1]**Mayo Clinic,** Rochester	Earl C. Elkins, M.D. Darrell Hunt	a-b-c-d-e	2 yrs	Sept	Certificate
MISSOURI					
[1]**Washington Univ. School of Medicine,** St. Louis	Sedgwick Mead, M.D. Beatrice F. Schulz	f-g[4]	2 or 4 yrs	Sept	Degree
[1]**St. Louis Univ. School of Nursing,** St. Louis	A. J. Kotkis, M.D. Sr. Mary Imelda	f-g[4]	2 or 4 yrs	Jan-Sept	Degree

Name and Location of School	Medical Director and Technical Director	Entrance Requirements	Length of Course	Classes Start	Certificate, Degree, or Diploma
NEW YORK					
Albany Hospital, Albany (in affiliation with Russell Sage College, Troy)	John W. Ghormley, M.D. Catherine Graham	a-b-d-e g[4]	12 mo 4 yrs	Sept	Certificate Degree
[1]**Columbia Univ.,** New York	Wm. B. Snow, M.D. Floy Pinkerton	a-b[3]-e f	12 mo 2 yrs	Sept	Certificate Degree
[1]**New York Univ., School of Education,** New York	George G. Deaver, M.D. Elizabeth C. Addoms	a[3]-b[3]-d-e g[4]	12 mo 4 yrs	Sept	Certificate Degree
NORTH CAROLINA					
[1]**Duke Univ., School of Medicine,** Durham	Lenox Baker, M.D. Helen Kaiser	a[3]-b[3]-d-e	15 mo	Oct	Certificate
OHIO					
[1]**Cleveland Clinic,** Cleveland	Walter J. Zeiter, M.D. Mildred Heap	a-b-d-e	12 mo	Oct	Certificate
PENNSYLVANIA					
[1]**D. T. Watson School of Physiatrics,** Leetsdale	Jessie Wright, M.D. Kathryn Kelley	a[3]-b[3]-d-e	12 mo	Oct	Diploma
[1]**Univ. of Pa. School of Auxiliary Med. Serv.,** Division of Physical Therapy, Philadelphia	George M. Piersol, M.D. Dorothy Baethke	e g[4]	12 mo 4 yrs	Sept-Feb Sept	Certificate Cert. & Degree
TEXAS					
[1]**Hermann Hospital,** Houston	Oscar O. Selke, Jr., M.D.	a-b-d-e	12 mo	Oct	Certificate
[1]**Univ. of Texas School of Medicine,** Galveston	G. W. N. Eggers, M.D. Ruby Decker	a-b-e d	12 mo	Jan	Certificate Degree
VIRGINIA					
[1]**Med. College of Va.,** Baruch Center of Phys. Med., Richmond (in affiliation with Richmond Prof. Inst.)	Walter J. Lee, M.D. Susanne Hirt	a-b-d-e g[4]	12 mo 4 yrs	Sept	Diploma Degree
WISCONSIN					
[1]**Univ. of Wisconsin Med. School,** Madison	Harry D. Bouman, M.D. Margaret Kohli	a-b-c-e-f g[4]	12 mo 4 yrs	Sept Sept-Feb	Certificate Cert. & Degree
U. S. ARMY MEDICAL SERVICE					
(a) **Medical Field Service School,** Brooke Army Medical Center, San Antonio, Texas, and	Charles D. Shields, Lt. Col., M.C. Agnes P. Snyder, Major, WMSC	b-e	12[2]	Mar-Sept	Certificate
(b) **Fitzsimons Army Hospital,** Denver, Colorado	H. B. Luscombe, Col., M.C. Harriet S. Lee, Major, WMSC	Completion of Medical Field Service School			
(c) **Walter Reed Army Hospital,** Washington, D. C.	John H. Kuitert, Lt. Col., M.C. Brunetta Kuehlthau, Major, WMSC	Completion of Medical Field Service School			
(d) **Letterman Army Hospital,** San Francisco	Arthur E. White, Col., M.C. Emma T. Harr, Major, WMSC	Completion of Medical Field Service School			

Entrance Requirements

FOR ONE-YEAR COURSE

a = Graduation from accredited school of nursing.
b = Baccalaureate degree with major in physical education.
c = Two years of college with science courses.
d = Three years of college with science courses.
e = Baccalaureate degree with required science courses.

FOR TWO-YEAR COURSE

f = Two years of college with science courses.

FOR FOUR-YEAR COURSE

g = High school graduation.

Footnotes

[1]Male students admitted.

[2]12 months' course includes training at the Medical Field Service School and Fitzsimons, Walter Reed, or Letterman Army Hospitals. Apply directly to the Surgeon General, Department of the Army, Washington 25, D. C.

[3]Additional college science credits required.

[4]Advanced standing students accepted.

Please address initial correspondence to the School of Physical Therapy in the institutions listed. Tuition and fees will vary from school to school.

Classified WANT-ADS

WANTED: An assistant physical therapist for a department opened May, 1951. This is a good opportunity for a recent graduate to receive experience under proper supervision. For details address Miss Nellie G. Brown, Superintendent, Ball Memorial Hospital, Muncie, Indiana.

UNIVERSITY OF ALABAMA needs part time physical therapist for cerebral palsy and speech clinic to begin at once. Full time work may develop later. Write: T. Earle Johnson, Box 2025, University, Ala.

WANTED: Female physical therapist, Assistant. Fully equipped department, 275-bed hospital. Please write giving age, qualifications, picture and date available. Lima Memorial Hospital, Lima, Ohio.

WANTED: Physical therapist for 150-bed general hospital. Salary open. Pleasant working conditions. Department supervised by Diplomate in Physical Medicine and Rehabilitation. Write Dr. Herman Rudolph, Community General Hospital, Reading, Pa.

HOSPITAL in the Midwest is in need of a qualified physical therapist, preferably one who has had training in cerebral palsy patient care. Excellent salary. Living quarters are available in the nurses' home. Two weeks vacation, 15 days sick leave and six national holidays are given annually. Write Anthony S. Dickens, Springfield City Hospital, East High St., and Burnet Road, Springfield, Ohio.

WANTED: Physical therapist with experience, especially in corrective exercises for arthritis patients. Must be willing to do part time office work. Forty-hour week. Phone or write TEmpleton 8-0830, 580 Park Avenue, New York City. Doctor E. F. Hartung.

WANTED IMMEDIATELY: Qualified physical therapist for Orthopedic Clinic and Outpatient Department. Under supervision of four qualified orthopedists. State qualifications. W. B. Carrell Clinic, 3701 Maple Ave., Dallas 4, Texas.

WANTED: Registered physical therapist experienced in general physical therapy. Personnel policies depending on experience include 40-hour week, two to four weeks vacation, 13 days sick leave, 8 paid holidays. Salary dependent on experience. Department medically supervised by American Board physiatrist. Write: C. V. Wynne, Superintendent, Waterbury Hospital, Waterbury 8, Conn.

PHYSICAL THERAPIST: Qualified for New York State. Interesting and varied program with adults and children in orthopedic hospital, midtown New York. Give age, references, picture, date available, and salary desired. Reply: Miss Florence Winters, Hospital for Special Surgery, 321 East 42nd Street, New York City.

WANTED: Physical therapist for full or part time work in orthopedic surgeon's office. Write to Daniel B. Eck, M.D., 144 South Harrison St., East Orange, N. J.

RATES

The rate per insertion is 75c per line. Typewrite your advertisement carefully and count 50 characters and spaces per line.

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